

AGRICULTURAL

IN
THIS
ISSUE:

Hydroponic Farming

Fertilizer Caking

Cattle Tick Control

Aerial Custom Application

The Acaricide Oxex

Views of a Dealer

Fertilizer Round Table

December 1956

Chemicals





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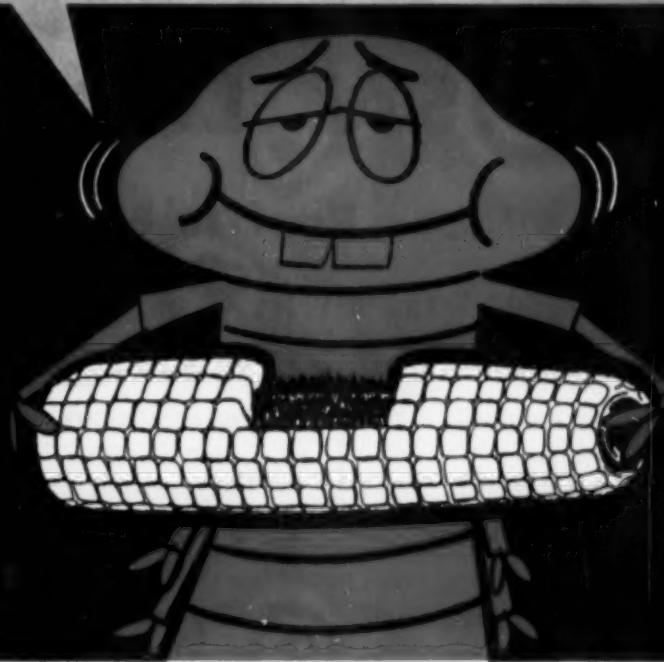
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AGRICULTURAL CHEMICALS



This Month's Cover

Top Photo: New Biological Testing Station and greenhouse of Olin Mathieson's Insecticide Division at Port Jefferson, Long Island. Bottom Photo: Cucumbers growing at the station are sprayed with a new fungicidal compound to measure effectiveness of the material. See story on pages 38, 39.

Vol. 11, No. 12

December, 1956

AGRICULTURAL

Chemicals

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MEETING CALENDAR

Dec. 3-5 — Chemical Specialties Manufacturers Association. Mayflower Hotel, Washington, D. C.

Dec. 6-8 — American Phytopathological Society. Netherland Hilton Hotel, Cincinnati, Ohio.

Dec. 9-12 — National Meeting of American Society of Agricultural Engineers. Edgewater Beach Hotel, Chicago, Ill.

Dec. 10-12 — North Central Weed Control Conference. Sherman Hotel, Chicago.

Dec. 12 — American Society of Agricultural Engineers, Edgewater Beach Hotel, Chicago.

Dec. 13-14 — Beltwide Cotton Production Conference. Dinkler-Tutwiler Hotel, Birmingham, Ala.

Dec. 26-31 — American Association for the Advancement of Science. New York City.

Dec. 27-31 — Entomological Society of America, national meeting.

Hotel New Yorker, New York City.

Jan. 9-10 — Wisconsin Insect Control Conference, the Loraine Hotel, Madison, Wisc.

Jan. 10-12 — Northeastern Weed Control Conference. Sheraton-McAlpin Hotel, New York.

Jan. 13-15 — Garden Supply Show. Kingsbridge Armory, New York.

Jan. 13-15 — Weed Society of America. Peabody Hotel, Memphis, Tenn.

Jan. 21-25 — Pacific Northwest Vegetable Insect Conference, and Northwest Cooperative Spray Project. Imperial Hotel, Portland, Ore.

Jan. 22-24 — California Weed Conference. Fresno Memorial Auditorium, Fresno, Calif.

Jan. 23-25 — Southern Weed Conf. Ben Aire Hotel, Augusta, Georgia.

Jan. 23-25 — Pacific Northwest Agricultural Chemicals Industry. Benson Hotel, Portland, Ore.

Feb. 4-6 — Cotton States Branch, Entomological Society of America, Birmingham, Ala.

Feb. 14-15 — Midwinter joint meeting of fertilizer manufacturers and the state college agronomists. Edgewater Beach Hotel, Chicago.

Feb. 19-20 — Alabama Pest Control Conference, and Alabama Association for Control of Economic Pests. Auburn, Alabama.

Mar. 5-6 — Western Cotton Production Conference. Hotel Westward Ho, Phoenix, Arizona.

Mar. 6-8 — National Agricultural Chemicals Association. Fairmont Hotel, San Francisco.

Mar. 27-29 — North Central Branch, Entomological Society of America, 12th annual meeting. Des Moines, Iowa.

Jan. 8-9 — Texas Fertilizer Conference. Texas A&M, College Station, Texas.

June 9-12 — National Plant Food Institute. The Greenbrier, White Sulphur Springs, W. Virginia.

June 17-19 — Association of Southern Feed and Fertilizer Control Officials. 15th annual convention. Dinkler-Tutwiler Hotel, Birmingham, Alabama.

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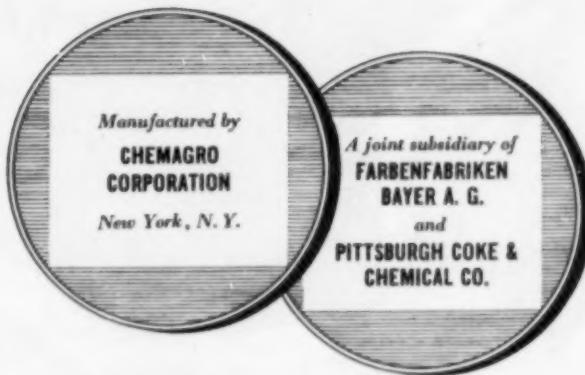
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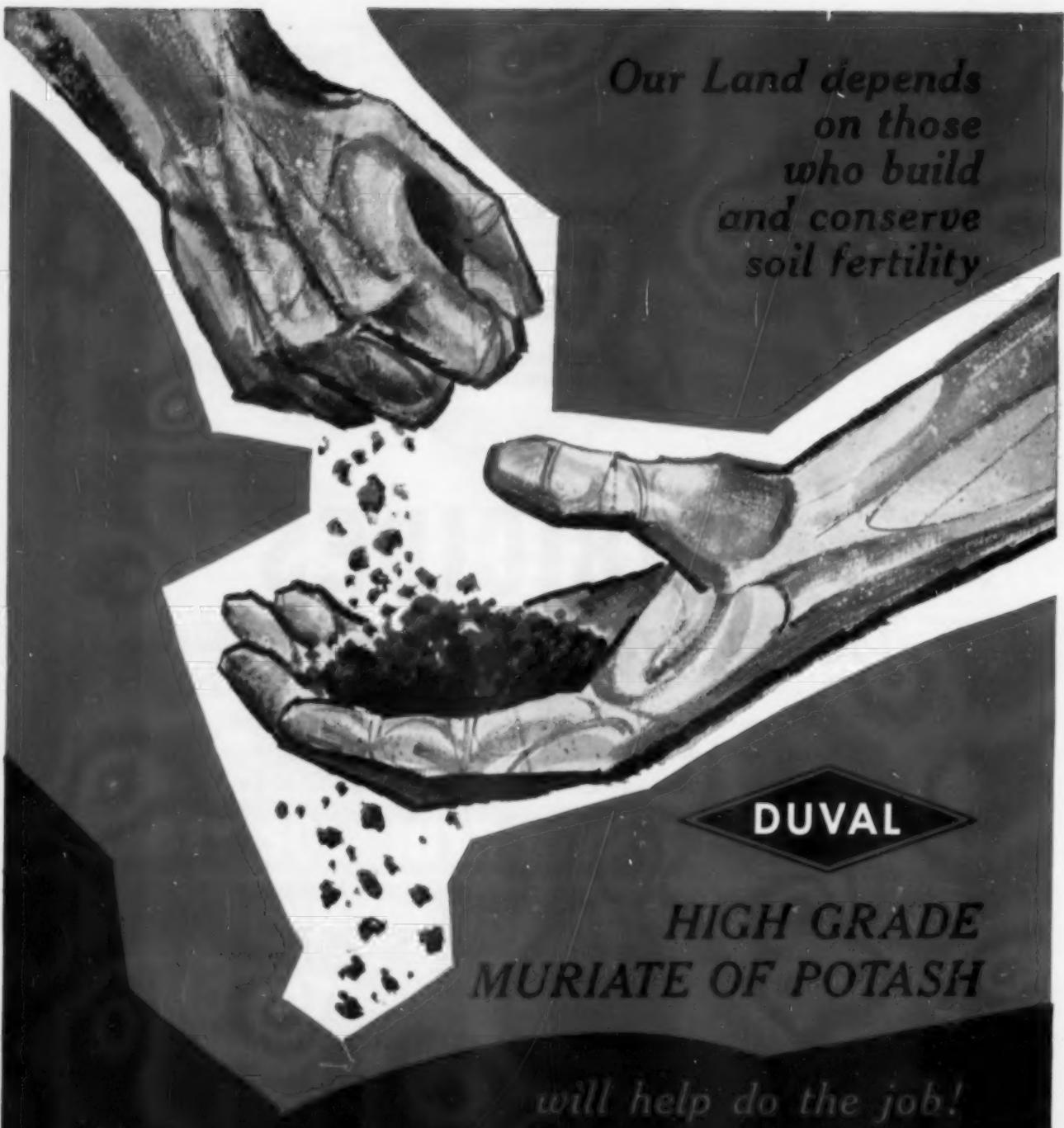
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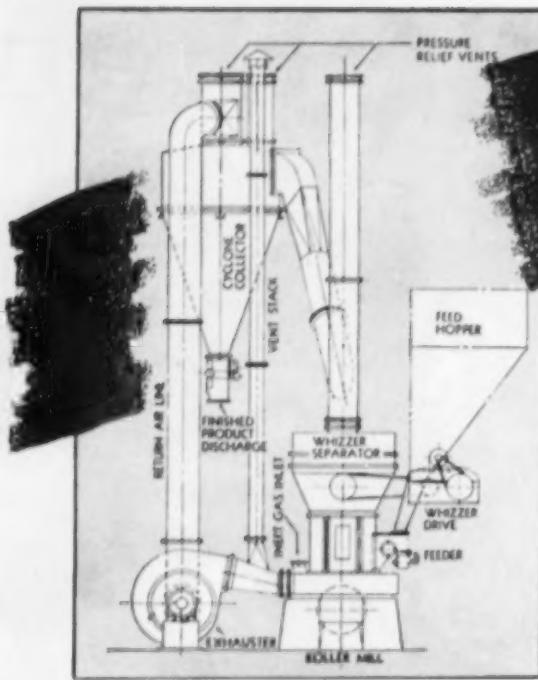
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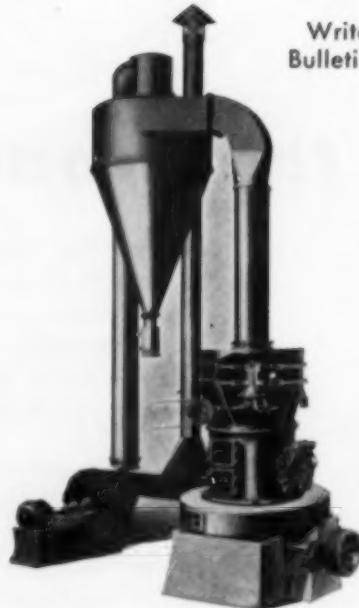
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In the Spotlight this Month

- **Hydroponic Farming** . . . Cheap labor is the answer to practical operation of 55 acre hydroponic farm in Japan, where vegetables for U. S. Army are grown. Page 32.
- **Cattle Tick Control** . . . Extremely heavy infestations, high costs of insecticides and lack of education among factors making tick control difficult on cattle in Central Africa. In view of these and other problems, dipping remains the most useful general method for control, with spray racing an alternate method in the hands of mechanically minded Europeans willing to give adequate supervision. Page 42.
- **New Biological Testing Station** . . . Olin Mathieson opens new biological testing station at Port Jefferson, N. Y., featuring a modern laboratory, field testing, toxicity and product analysis facilities. Page 38.
- **A Dealer Talks** . . . Chief Jones, pesticide dealers tells an *Ag Chem* reporter what he does for his customers, and what suggestions he makes to them when they turn to him for service. Page 36.
- **Fertilizer Caking** . . . Production expert for a Scottish company reports on how they have solved caking in granulated fertilizers. Moisture contents, he says, is the one most important factor to be considered. Page 34.
- **Dow's New Acaricide, Ovex** . . . Offering good control of mites in orchards, this new compound is reported to produce no unfavorable effect on flavor. Page 46.

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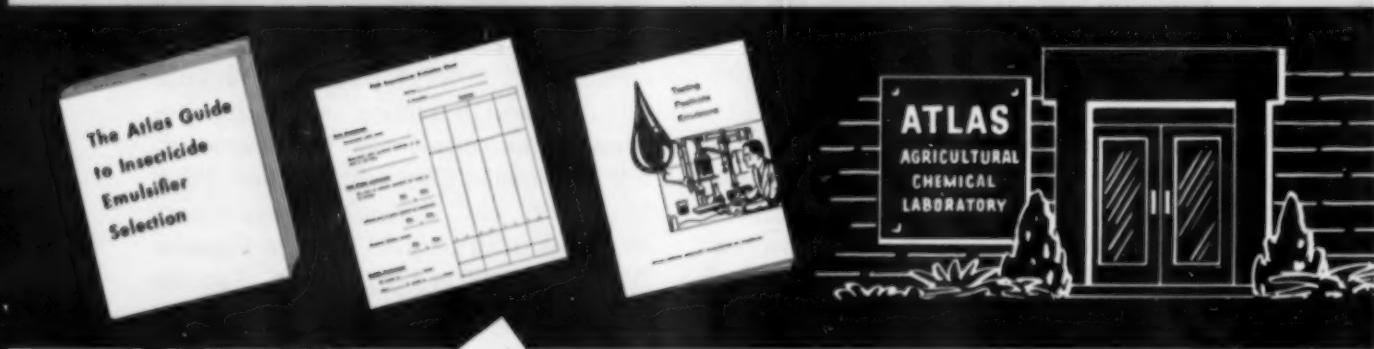
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1 Atlas Guide to Insecticide Emulsifier Selection

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- Adjust for mixed solvent systems; possibly reduce solvent costs.
- Adjust for solvent changes to take advantage of spot purchase opportunities.
- Adjust for varying field dilutions.
- Adjust for varying field water hardness . . . prepare formulas for specific water areas.
- Select emulsifiers for adding new formulas to your line based on established toxicants.
- Determine whether you can cut costs by adjusting emulsifier percentages.

NOTE: Because the Guide is useful only to volume formulators of chlorinated hydrocarbon insecticides for agricultural use, it will be presented personally by an Atlas representative to those who request it on their company letterhead.

2 Field Evaluation Charts

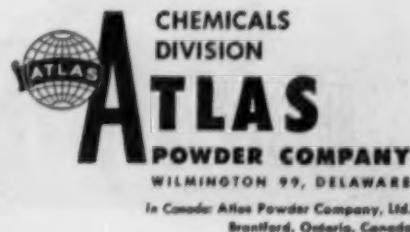
. . . a guide and check list useful to the chemist in directing his staff, to establish required field use conditions and desired performance. Pads of charts available on request.

3 Suggested Test Methods

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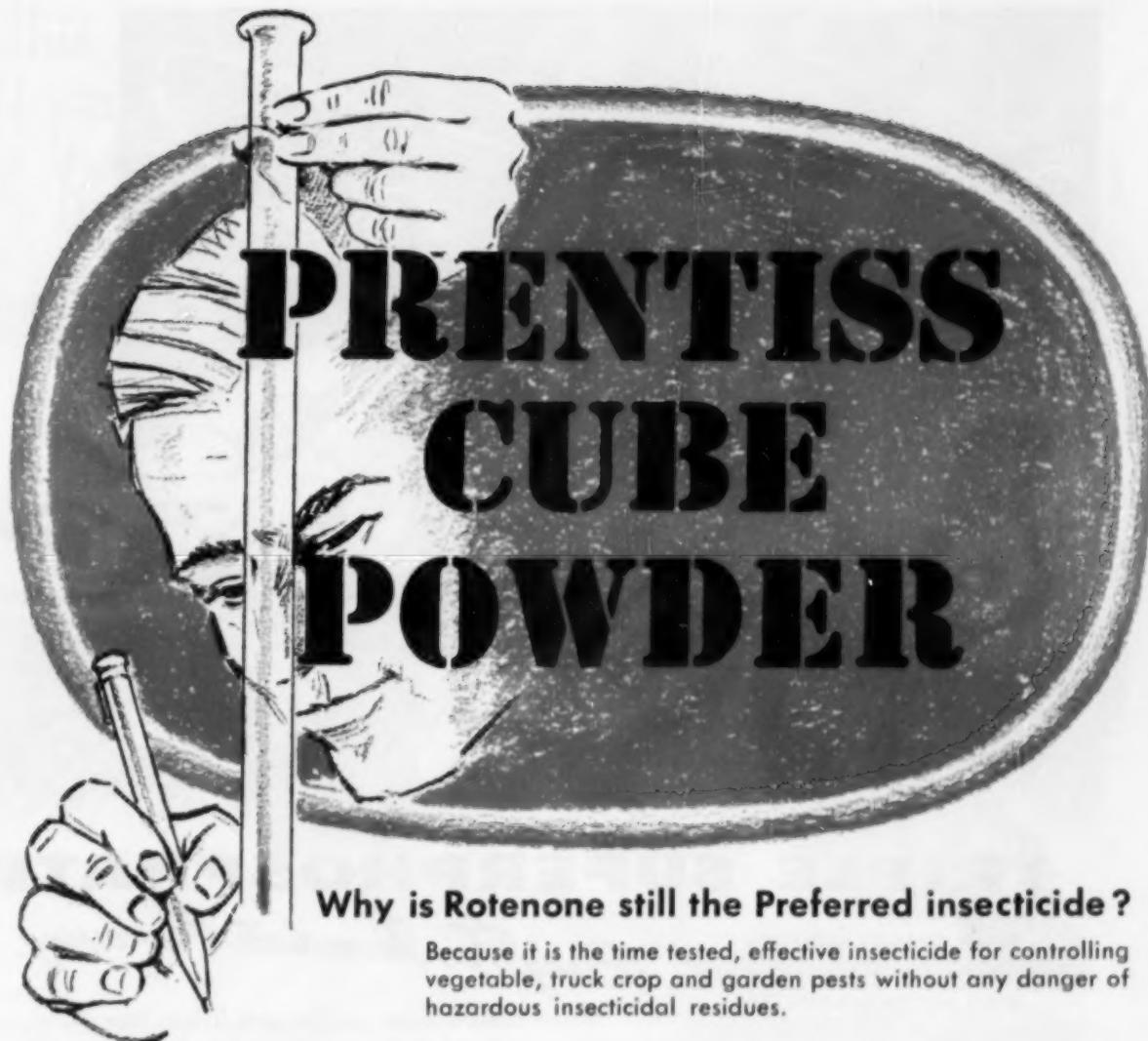
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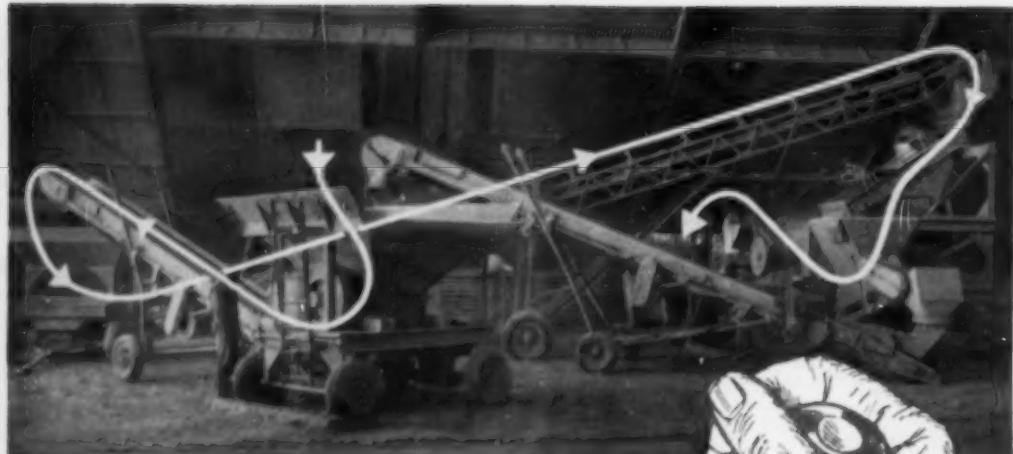
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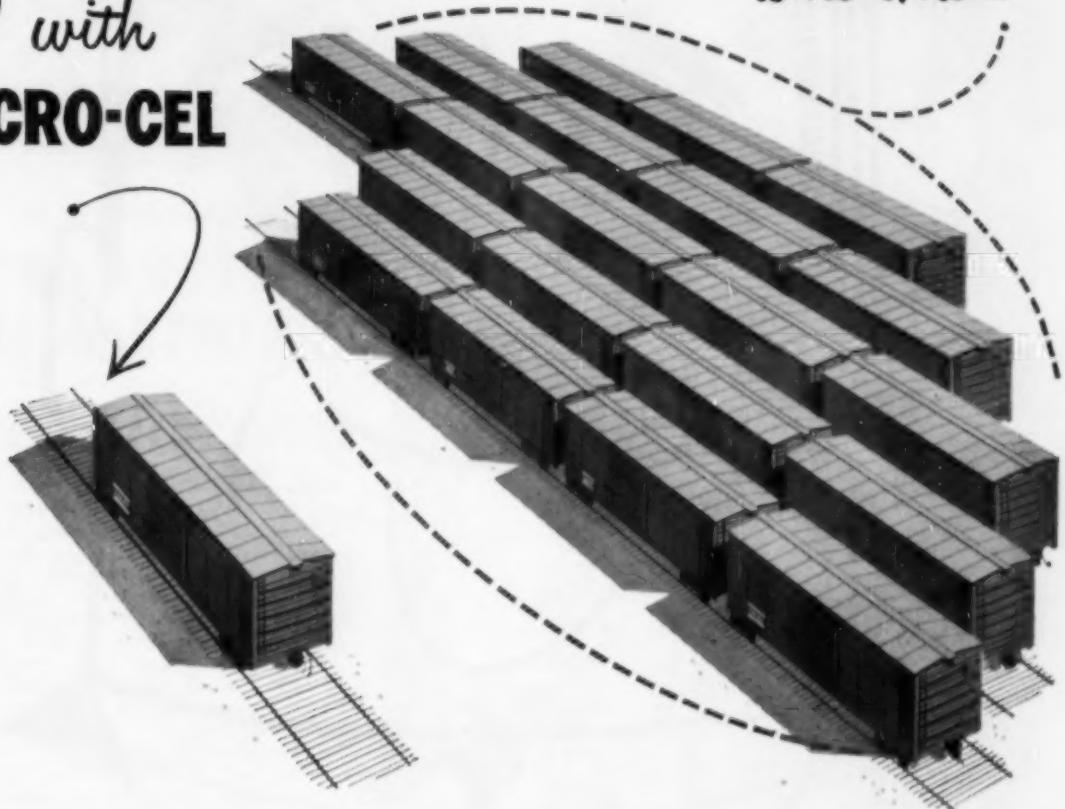
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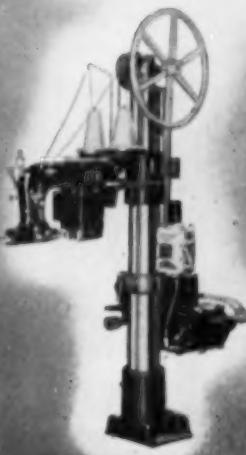
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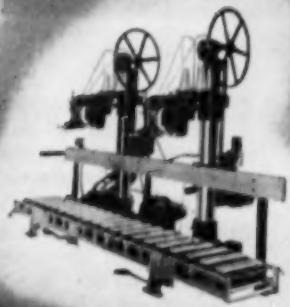
CLASS 21800 (left) for fast, mechanical closing of bags. Incorporated in Style 21800 is with conveyor and bags in sewing for making tape bound closure, is cut off automatically at end of closure. Sewing head and conveyor adjustable vertically.



CLASS 20500 (above) machines are heavy duty, high production units for closing medium and heavy weight bags. Available with power-driven horizontal conveyor, inclined conveyor, or both; or with conveyor transmission unit only, for plant production line.



STYLE 20100 H (left), is a heavy duty, high production, compact type machine designed for use with plant conveyor systems. Sewing head is pedal controlled.



DUPLEX MACHINES (right) are designed for strong, sturdy bags. The hot sewing head closes chamber bags, the round closure either the outer bag alone, or both bags together for extra safety. Also recommended for unique closures where continuous operation is a must—operator can readily switch to either head.

**BAG CLOSING
MACHINES**

MORE PRODUCTION WITH LESS EFFORT!



ALL FROM ONE SOURCE:

anhydrous ammonia
fertilizer nitrogen solutions
sulfuric acid
and soon phosphoric acid

FROM no other single source can the fertilizer manufacturer obtain the particular combination of essential agricultural chemical raw materials to be available soon from the U.S.I. facilities at Tuscola, Ill.

Anhydrous Ammonia and Fertilizer Nitrogen Solutions. The raw materials for this operation are produced on the spot, insuring that supply is steady, reliable and ample.

Sulfuric Acid. U.S.I.'s 400 ton per day sulfuric acid plant produces all grades of virgin acids, including electrolytic and oleum, plus a good quality of process-spent acid suited to fertilizer manufacture. This plant operates year round, permitting U.S.I. to store during off-seasons for the large in-season demand.

Coming Soon — Phosphoric Acid. U.S.I. is building a new plant at Tuscola to produce wet process phosphoric acid from phosphate rock and U.S.I.'s sulfuric acid. The plant is scheduled to go on-stream by the end of 1956. Design capacity

will be 30,000 tons of P_2O_5 shipped as 75% phosphoric acid.

Other Agricultural Chemicals. U.S.I. can supply special products on a long term basis, if the demand becomes evident. This because facilities are flexible — integrated with all the manufacturing units at Tuscola which produce a wide variety of chemicals.

In the heart of the midwest farm area, U.S.I. provides one flexible source for fertilizer raw materials—a source organized for prompt service.

For further information, address your nearest U.S.I. office, or contact Chemical Sales, U. S. Industrial Chemicals Co., 99 Park Avenue, New York 16, N. Y.



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AGRICULTURAL CHEMICALS

Sulphur

helps to create headline products



ALUMINUM

Surely a 'headline product' even if not new! Aluminum is very much in the news today for it is playing a leading role in our steadily expanding economy.

What's all this got to do with Sulphur?

It's like a chain reaction. Demand for this remarkable light metal is increasing. This calls for more ore development and additional mills for the reduction of alumina to aluminum. More cryolite is needed for fluxing the molten alumina in the electrolytic cells.

True, cryolite (Na_3AlF_6) is found in nature but there just isn't enough tonnage to satisfy its many uses. So, to fill the supply gap, cryolite is being synthesized from fluorspar. It is here that Sulphur enters the picture, for one of its widely used derivatives — Sulphuric Acid — is a key reaction agent.



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When it's loaded with International's

"We like to see our ship come in!"

Mr. Alex Mooney,
General Sales Manager, Fertilizer Division
Canada Packers, Ltd., Toronto, Canada



Boat shipments of International's Triple arrive in excellent physical condition—just right for easy, quick unloading and for excellent ammoniation results



Water shipments mean immediate savings in shipping costs. International's Triple is loaded into ocean-going vessels at Tampa, Florida.



Even after a long, rugged trip, International's Triple unloads easily . . . cutting Canada Packers' handling costs to a minimum.



Nine modern plants make up the Fertilizer Division of the Canada Packers organization. Mixed goods are sold in Canada and the states.

Triple Superphosphate . . .



"OUR first shipment of triple docked more than a year ago. It worked out fine . . . so have the rest," says Alex Mooney, general sales manager of Canada Packers' Fertilizer Division. "We're sold on ocean and lake-going vessel shipments, and particularly on the way International's Triple comes through in such fine physical condition."

This alert Canadian firm, headquartered in Toronto, was quick to take advantage of the savings offered by International's water shipments.

"We realize immediate savings in shipping costs. And excellent physical condition of International's Triple helps us hold down labor costs for handling. The moment the hatches are opened you can see that labor for unloading will be cut to a minimum."

These water shipments are a real test for the shipping and handling qualities of International's Triple. It is subjected to the rugged shipping conditions of ocean, river and Great Lakes travel.

When it reaches its final destination—the 9 Canada Packers plants—the triple goes into approximately 10 different high-analysis fertilizer formulas. Here again International's Triple gives further proof of its superior quality.

"In shipment after shipment we have been very happy with the ammoniation quality," adds Mooney. "It's the excellent physical and chemical condition of International's Triple that gives us such results."

Canada Packers is typical of a constantly growing number of firms who have tried International's Triple and have been satisfied.

The reason: Exclusive Bonnie processing produces a triple with built-in extras that help them cut costs. Uniform, fine texture means superior handling qualities. Natural curing for a minimum of 5 weeks gives them better control of manufacturing conditions . . . helps simplify formulation problems.

These users get the extra benefits of a guaranteed constant minimum of 46% APA. What's more, they're sold on International's friendly cooperation; fast, efficient shipping; and a modern warehousing program for off-season storage.

If you are not already using International's Triple, you owe it to yourself to put us to the test. You too will be satisfied.

Write or wire International Minerals & Chemical Corporation for full information on prices, shipping and warehousing arrangements.



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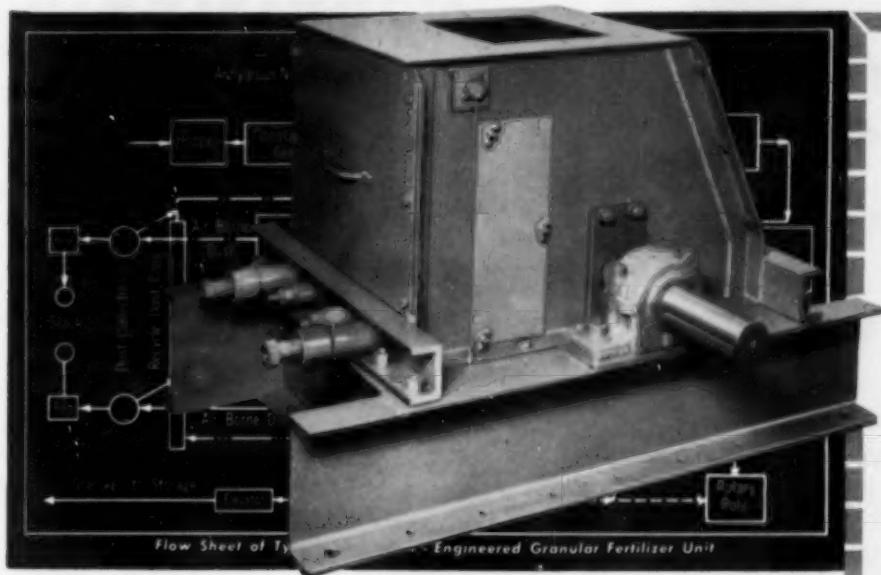


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This Rotary Pulverizer Belongs In Your Fertilizer Unit, Too!



IT'S STURTEVANT-ENGINEERED TO GRIND UP TO 35 TONS OF TAILINGS PER HOUR

Mixing plant operators agree! They'll tell you that a Sturtevant Rotary Pulverizer beats anything else for keeping a granular or powdered fertilizer unit speeding along at full capacity. It's far better than Hammer Mills with hammers that stick . . . Cage Mills that skip small pellets . . . Knives that only slice and shear. No overload stoppages nor clogged grates. So, daily accumulation of over-sized lumps is no longer a problem. And, to top it off, original Sturtevant "Open-Door" accessibility makes cleaning quick and easy.

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Investigate now! Filling out the convenient coupon at the right is the first step toward better fertilizer at lower cost. Why not mail it today?

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A new **HERBICIDE** . . .

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AMINO TRIAZOLE

Weedkiller

Introductory commercial sale of Cyanamid's Amino Triazole in 1956 met with enthusiastic acceptance by farmers and agricultural authorities. Practical economic control of weeds such as Canada Thistle and Quack Grass has returned infested fields to productive crop use, or eliminated costly repeat-application control methods.

Through a unique spreading action within the entire plant structure, a contact spray of Amino Triazole kills the foliage and roots of hard-to-kill weeds. This herbicide is effective in economical dosages against many weeds, some of which have heretofore been among the most difficult to control.

A boon to farmers harassed by weed infestation, Amino Triazole will be attracting widespread attention in 1957, its first year of full commercial availability. Drop us a line for details on its proved potentials.

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effectively controls
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Canada Thistle
Quack Grass
Cattails
Tules
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Editorial COMMENTS

WHETHER or not one approves the general principle back of the Soil Bank program, the fact remains that the agricultural chemicals industry has on its hands a major problem in adjusting to the effect the Soil Bank will have on sales of fertilizer and pesticides. In the light of a survey completed last month by the NPFI, the problem looms large indeed.

It is just as readily apparent that 1957 will be the crucial year, the "year of decision" that may well determine the ability of the agricultural industry to cope with the general problem of any legislative reduction of acreage in cultivation. For the farmer 1956 was a test period—a year in which he was learning his rights and obligations under the somewhat complex Soil Bank plan. In the coming year he will be primed to take fullest monetary advantage of the Soil Bank, putting as much of his unprofitable land as possible into the Acreage and Conservation Reserve Programs.

For the fertilizer industry (and, to a lesser degree, for the insecticide industry) the Soil Bank will mean a slight tightening of the belt, sharpened competition, a major re-education problem, and sharp cutbacks in demand in certain localized areas. In these areas, most of them in wheat and some in tobacco-growing sections, the first to feel the pinch will be the small manufacturers and dealers who for long years have been marketing their products primarily to growers of a single crop. For these manufacturers or dealers, 1957 will be particularly decisive, for some even a matter of "sink or swim."

No matter how much we try to kid our-

selves, we must eventually come to the realization that the average farmer, as presently educated, will not spend as much to put in fertilizer and kill insects in cover crops as he will in prime winter or spring wheat. Far too many farmers see the Soil Bank as a means to make up for a generally lower income over the past few years, and figure on getting by with a minimum cover crop as all they need to meet their obligations to the government.

During the coming season it will be up to industry to make the farmer realize the fallacy of this line of reasoning. Farmers, state and county agricultural stabilization and conservation committees (which are responsible for administering the Soil Bank), local agricultural agents, and even the industry's salesmen must all be educated in the prime values of adequate fertilization and insect control for cover crops. Farmers must be sold on the idea of increasing profits through increased yields on the land that remains under cultivation, and on the long-term values of fertilization of cover crops as a means of general soil enrichment.



So we keep hearing about the numerous activities of the Fertilizer Section of the National Safety Council, we have often wondered just why it is that there is no insecticide section of the NSC. Certainly it is not for lack of work to be done in the insecticide field . . . for in addition to the normal safety problems that are common to all industrial plants in the prevention of accidents, there are other hazards connected with the

(Continued on Page 111)



Gene Heckathorn, president of United-Heckathorn, pilots his own Beechcraft for observation and supervision of U-H's widespread spraying jobs.

UNITED-HECKATHORN AERIAL SPRAYING

THE main office of United-Heckathorn is in Richmond, Cal., on the northeast shore of San Francisco Bay, but the organization's executives are rarely to be found there. Eugene Heckathorn, key figure in the enterprise who, however, vigorously disclaims sole credit for its remarkable growth, has an explanation for the chronic absence of its top men:

"We're all basically field people. We already know what's in this office but we don't know what's happening in the field without going out and working in it. After all, the most important thing in the agricultural chemicals business is consumption, and we are always thinking in terms of application of chemicals. The consumer's the only guy who's important to us, and unless we satisfy him we won't have a stable business. So we approach the whole thing from the application point of view, and we're proud of our development as good field operators."

"We have a diversified organization. We process chemicals for domestic and foreign consumers, and also co-manufacturers. But beyond that we're not trying to sell a product or merchandise a brand name.

What we're selling primarily are programs to growers and to agencies combating epidemic infestations.

"We are not recommending this as the type of marketing that should be used by the industry, of course. It is very limited and can only be used in certain areas where application is a key factor. There are certain localities and certain types of marketing where we would not consider our merchandising feasible."

United-Heckathorn was started in 1948 with about \$12,000 capital. Now its yearly gross is in the millions. "Each year we think our growth is going to level off, but it doesn't," Heckathorn reports. "We apparently are able to keep satisfying an increasing number of customers' needs."

Eugene Heckathorn has been in the chemical business all his working career, which has not been extremely long for he is only 37 years old now. He was educated in the industry. He started in the insecticide processing end with R. J. Prentiss & Co. in New York. But apparently his eye was always on the user. In 1947 Prentiss sent him out to Richmond, a West Coast chemical industry center, to es-

tablish California processing headquarters. A year later, Heckathorn and several associates bought out the company's California interests and set about developing upon this base an organization which they envisioned as medium-sized, versatile, and governed by what were then becoming increasingly influential application considerations. (That a chemical processing firm should go into the application field was a rather shocking idea to the industry at that time.)

California presented an excellent opportunity for a diversified operation, with its wide range of crops, its long growing season, its many high-priced farm products, and its many large farms. One by one the group bought up relatively small existing companies in both the chemical and application fields and integrated them into its over-all plan. In 1950, on the basis of the varied experience it had gained in serving California customers, it established a contract division to tackle epidemic infestations anywhere. Spectacularly successful in dealing with several major epidemics by aerial application, this division has won national fame for the organization.

COMPANY— ANYWHERE!!

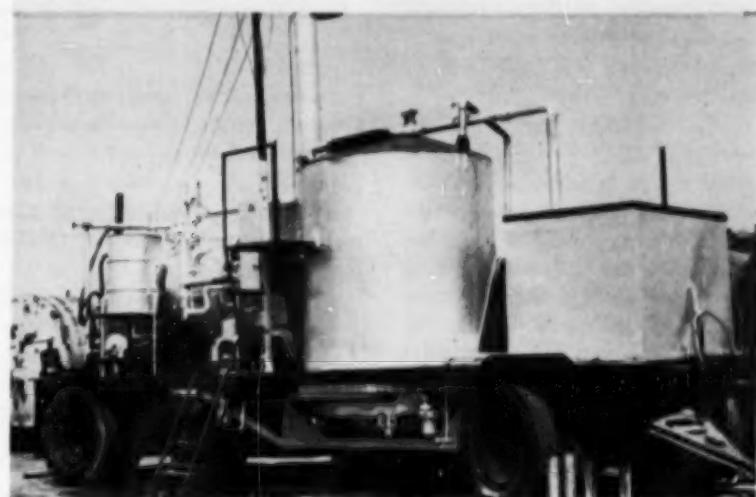
United-Heckathorn's main plant and offices are located on a 5-acre site in Richmond's industrial section, adjacent to both rail and ship terminals. The plant, which has been operating three shifts a day seven days a week for more than three years, employs sixty-five to seventy people and contains a great deal of automatic handling equipment. It turns out some 250 separate items. Smaller plants and service headquarters are also maintained at El Centro in the Imperial Valley, Corona in the Southern California citrus section, Lemoore in the southern San Joaquin Valley, and Soledad in the Salinas Valley. Each of these installations which have been taken over or bought into by United-Heckathorn continues largely autonomous operation.

"We prefer decentralized management," Heckathorn explains. "We keep a local manager in each area, preferably the same man who was manager when we bought the company. We centralize only the local offices' accounting and purchasing. Often we don't change the name of the company, as we would rather not

(Continued on Page 113)



A SkySpray flying boxcar, equipped with a special spray boom developed for the Florida Medfly campaign, awaits loading at field mixing station.



Top: United-Heckathorn's mobile chemicals processing unit. Bottom: Drums of United-Heckathorn-processed DDT being loaded at Richmond, Calif. for transportation to India for UNICEF.





Sprinkling head lettuce seed beds prior to transplanting. Surface irrigation is employed on propagation work.

Japanese Hydroponic Farm Raises Vegetables For

US. Armed Forces in the Far East will use 9,000,000 lbs. of vegetables this year that were grown under highly unusual conditions — in row upon row of cultivated gravel beds in a farm on the outskirts of Tokyo.

The vegetables were and are growing at the U. S. Army Quartermaster Corps hydroponic farm—by far the largest of its kind in the world. Although many of the items produced at the farm matured after being transplanted to a soil section adjoining the hydroponic beds, all began life as seedlings in the chemically-treated gravel.

The farm at Chofu, Japan, consists of 55 acres of hydroponic beds and 296 acres of soil. Five acres of the hydroponic section are under glass, making up one of the world's largest greenhouses. All kinds of vegetables have been grown there, but the emphasis is on those items most needed by United States troops which cannot be shipped from stateside

farms without too much spoilage — tomatoes, lettuce, green onions, cucumbers, etc.

The hydroponic farm was built in 1946 for the sole purpose of supplying fresh vegetables to United States forces. At the time, it was impossible to obtain such vegetables from Japanese farms, because all food was in such short supply that the Japanese people themselves were on a rationed basis. Even more important was the fact that the ages-old Japanese habit of using night soil as fertilizer was likely to infect vegetables and cause amoebic dysentery and intestinal parasites.

There are 11 five-acre plots in the hydroponic part of the farm's operation. Each plot has 87 gravel-filled beds, all 300 feet long, 4 feet

wide, and 8 inches deep. Each of these beds is divided into three sections — one 120 feet long, a second 100 feet long, and a third 80 feet long. The sections are set up in tiers so one can drain into the other, holding down losses of the chemical solution through evaporation and transpiration. On hot, sunny days, such losses could reach 10,000 gallons on each five-acre plot.

Chemicals are mixed in sump tanks located at the lower end of each plot. When the correct nutrient solution is mixed, it is pumped to a header tank with a capacity of 90,000 gallons. From there, the solution flows by gravity into the first, or highest, gravel bed — the 120-foot part. When the solution reaches a level about one inch below the surface of

Head lettuce growing in hydroponic beds at Chofu.



Spraying head lettuce for control of grey mold.



American Armed Forces

the gravel, it is allowed to drain into the second bed, and then in turn into the last bed. Then it flows back into the sump tank and is pumped again to the header tank.

The complete draining process takes from 45 minutes to an hour. It normally is repeated three times a day.

The nutrient solution supplies all the chemical elements considered essential for growth except one—carbon. That reaches plants from the air in the form of carbon dioxide, of

course. Furnished artificially are nitrogen, potassium, calcium, phosphorus, sulfur, magnesium, iron, manganese, boron, copper, zinc and molybdenum.

Nitrogen, potassium, calcium, phosphorus, sulfur and magnesium are used in relatively larger proportions and are called "macro" nutrients. The other elements are required in very low concentrations. They are dubbed "micro" nutrients.

Not all plants thrive equally on the same nutrient solution, and other conditions often make it necessary to vary the ingredients of the solution. However, there is a standard solution used as a base for operations. It follows:

Chemical	Amount used per 1,000 gallons of water
Potassium nitrate	9 lb., 3 oz.
Calcium sulfate	6 lb., 6 oz.
Magnesium sulfate	4 lb., 6 oz.
Triple super phosphate	2 lb., 10 oz.
Ammonium sulfate	1 lb., 3 oz.
Ferric ammonium citrate	1 oz.
Manganese sulfate	.1 oz.
Boric acid	.5 oz.
Copper sulfate	.01 oz.
Zinc sulfate	.02 oz.

Key to the success of irrigation with the solution is in supplying the right amount of oxygen to the plant roots. If the air spaces between the

gravel are filled with liquid for long periods the roots will not be able to breathe and will die.

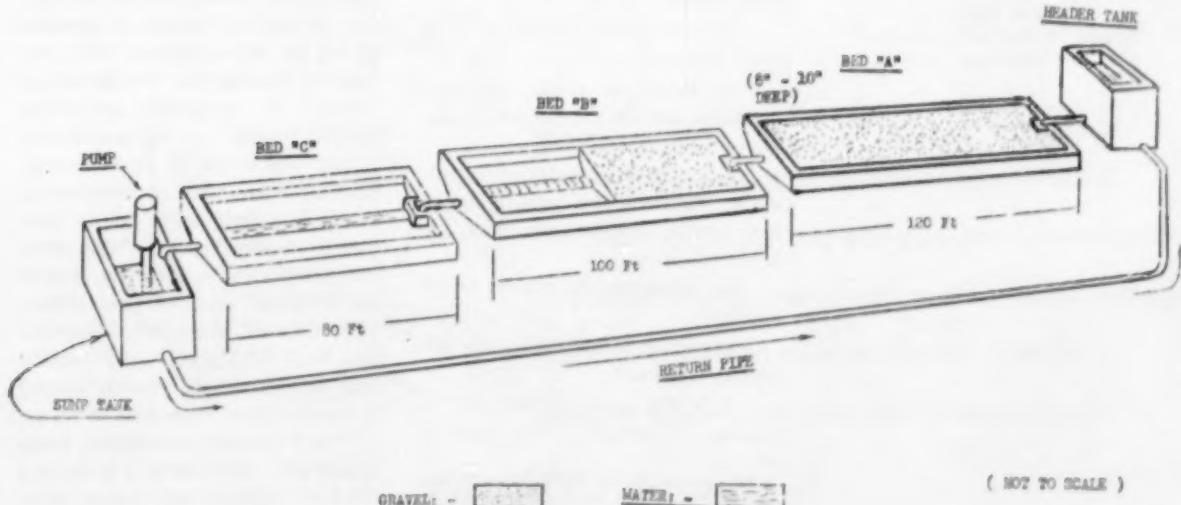
The solution is analyzed twice a week to see if it has been diluted and must be changed to stimulate growth. Tests are administered by one of three full-time professional chemists who takes a field sample of the solution to a modern, fully-equipped laboratory on the farm. One plant pathologist, one entomologist and two horticulturists also operate from the laboratory.

The amount of detailed labor necessary to watch over growth of infant plants in gravel beds is considerable, and for that reason hydroponic farming is economically feasible only in countries such as Japan where labor is relatively inexpensive. The Chofu farm employs a maximum of 536 Japanese during the height of the growing season. Even during the winter, there are slightly more than 200 regular workers.

Some 65 percent of the laborers are women, and their average wage is 35 cents an hour — small by American standards, but more than twice that paid workers on adjoining farms. Proof that the laborers are content is found in statistics showing that 90 to 95 percent of the seasonal workers return every year.

(Continued from Page 119)

DIAGRAM OF HYDROPONIC SYSTEM





Overcoming a Caking Tendency in **GRANULATED FERTILIZERS**

by **Bernard Raistrick**

Research Manager
Scottish Agricultural Industries
Edinburgh

OVERCOMING the problem of caking in granulated fertilizers by practical manufacturing procedures was the subject of a recent talk¹ in London by Dr. B. Raistrick, Director of Research, Scottish Agricultural Industries, Aberdeen, Scotland. A brief review of the main points of his address follows. Some of these findings may prove helpful to operating personnel in our own country.

The problem was analyzed along these lines:

- A. Study the nature of caked fertilizers and the mechanism of caking by laboratory techniques.
- B. Study the manufacturing processes. Assemble the facts of operation such as temperatures, rates, analyses, moisture, etc.
- C. Investigate the possible use of additives.

Important findings from this laboratory approach:

- (a.) *The cause of bridging or binding of particles.* The chemical

causing granules to bind and cake is crystalline ammonium chloride. These crystals formed a bridge and occurred during storage by a recrystallization from traces of solution on surfaces. Careful studies proved that ammonium chloride tends to concentrate on the surfaces of granules (This has also been reported by other investigators, and confirmed by work at U.S.D.A., Beltsville, Maryland, U.S.) Explanation: saturated fertilizer solution diffuses to surface of granules during the drying process. Also, ammonium chloride has a tendency to "creep." To prove this, one of the analyses having a strong tendency to caking was extracted at room temperature with different amounts of water kept small so as not to completely dissolve any ion. The chemical analysis for some of the ions in the saturated solutions gave NH_4^+ —0.85, Cl^- —0.41, K^+ —0.047, PO_4^{3-} —0.041 and SO_4^{2-} —0.23 gram. And ammonium chloride needle crystals formed in great volume from such solutions.

- (b.) *Humidity conditions inside a bulk pile.* 800 tons of a granulated 7.5-8-10 fertilizer with average mois-

¹Proceedings No. 26, The Fertiliser Society, London, W.C.1. This paper was condensed for *Agricultural Chemicals* by Vincent Sauchelli.

ture content of 3.4%, were stored in bulk in an area 50' x 50', height about 13'. A metal tube extended from the middle of pile to the surface. The tube was used to withdraw air from the pile and measure its temperature. After five weeks, the temperature near center of pile was 25-28°C (77-82.4°F) and the dew point was 20-22°C (68-71.6°F). It was observed that water condensed wholesale in the apparatus outside the pile when air was drawn up the tube into the apparatus.

(c.) Operating Conditions fluctuated.

In an 8-hour shift it was observed operating conditions could vary widely. Example: temperature of product coming out of co-current drier varied from 76° to 98°C (168.8 to 208.8) with one sudden increase to 128°C (226°F) and moisture content ranged from 0.8% to 4.6% or more. (Moisture content determined by drying at 100°C in a fan equipped oven for 4 hours.)

(d.) Additives gave poor results. Additives were tested at $\frac{1}{4}\%$, 1% and 5% included magnesia, Fullers earth, talc, lime, diatomaceous earth, dicalcium phosphate and aluminum stearate.

At moisture contents of 2 to 5% range, the additives did not prevent caking. With a moisture content below 2%, the fertilizer was less hard especially when kept apart from a higher moisture product.

(e.) Influence of ammoniation in caking.

Ammoniated at rate of 2.2 lb. NH₃ per 100 lbs. super, fertilizer behaved similarly as to caking as non-ammoniated product.

At the end of these preliminary tests, Dr. Raistrick summarized his impressions: "caking was probably due to recrystallization forming ammonium chloride bridges between adjacent granules. This recrystallization occurred because of the presence of moisture, and maybe because at pressure points (and fertilizers set hardest when under load) salts will dissolve in otherwise saturated solutions and deposit at points of lower stress."

f. Relation between vapor pressure and caking tendency.

Moisture content of fertilizer is the most important single factor in determining caking behavior.

Moisture studies:

Decided that most reliable and convenient method of expressing moisture activity is to measure the water vapor pressure over the granules and to express it as relative humidity. This relative humidity was then correlated with propensity to cake. Devised special method to measure the humidity of the air in equilibrium with fertilizer.

After much study and testing, it was decided that "an immediate solution to the problem of caking of NPK fertilizers involved reducing the relative humidity to less than 30%" and this in turn meant reducing the moisture content of normal products to about 1% or below. . . . The exact safe maximum moisture content varies considerably with composition, and especially with superphosphate content: for example, 12-4-12 has a low super content and therefore needs more thorough drying. It is because of the effect of this variation in composition that relative humidity was chosen as a better guide to safety than moisture content. The moisture limit is in the neighborhood of 1% when the super content of the granules is in the range of 30-50% and is higher or lower when the super is respectively above or below this range.

(g.) Influence of fines on caking tendency.

Belief is current that a high fines (or dust) content leads to bad caking properties. Experiments showed that, in their case at least, this belief is not

warranted. Good screening alone is no answer to the caking problem. Other good reasons exist of course for removing fines.

(h.) Influence of temperature on caking.

Belief that efficient cooling of granules is essential to prevent caking is not substantiated by tests. Large-scale tests were made to test this belief. If moisture content is kept low, cooling has no influence. If moisture content is high, cooling does not prevent caking. Other excellent reasons exist however, for cooling product prior to bagging.

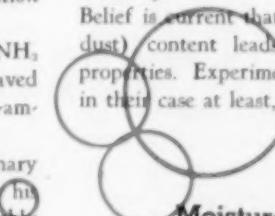
(i.) Influence of condition of paper bags on caking.

Condition of paper bags for packing becomes of great importance in the prevention of caking during storage. Punctures of the bituminous ply or cracks in this interlayer caused by rough handling of filled bags induced lumps of caked product around these weak spots in the bituminous interlayer.

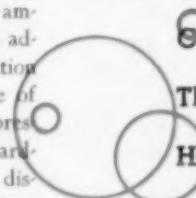
(j.) Thorough drying on full scale plant.

By the end of these several series of long time tests, faith was strong that thorough drying is the means of preventing caking of all fertilizers all the time, and this means the *whole* production has to be dried to below 1% moisture content: it is not enough that the *average* moisture should be below 1%. To assure success it is absolutely essential that the process operation be maintained under steady conditions with a minimum of stoppages. A thoroughly dried product was produced by reducing through-

(Continued on Page 115)



Moisture content most important single factor!



Condition of paper bag an important consideration.



Thorough drying one means of preventing caking.

High fines content does not lead to caking.

Efficient cooling not essential to prevention.



A DEALER TALKS!

pensing as much misinformation as information. Agricultural Chemicals was therefore pleased to talk with Chief Jones of Muleshoe, Texas, who was selected by NAC* as a representative dealer to speak on its panel "Who and What Influences the Grower in His Selection and Use of Pesticides" at the recent NAC session.

Chief Jones' operations are by no means typical of those of the average dealer, because in addition to handling feed, seed, fertilizers, insecticides, and anhydrous ammonia, he offers a complete custom application service (ground and aerial) to his customers. His sales totals are about half a million dollars a year, fifty to sixty percent of which may represent fertilizers alone. Mr. Jones has nine application rigs and equipment for applying liquid fertilizer and anhydrous ammonia. He was particularly proud to describe a new application rig: with an 8-foot easy-flow spreader mounted at the back of the driver, which allows simultaneous applications of dry and liquid fertilizer. The equipment also permits application of any N-P ratio desired.

The Chief purchases most of his agricultural chemicals from major

formulators (Olin Mathieson, Hercules, Stauffer Chemical Co., Plainsmen Supply, etc.). When doing a custom application job for a customer, he makes separate charges for the materials, the application service, and still a third charge if anhydrous ammonia is applied. As a matter of routine, he takes soil samples for customers purchasing chemicals and fertilizers from him. He will also take soil samples for farmers not buying from him and in this case makes the nominal charge of \$1.00. The soil samples are sent to a soil testing laboratory in Lubbock for analysis.

A relatively new routine in the Chief's operation in selling chemicals or doing an application job for a customer is the sampling of each "job" sold. As will sometimes happen, reports the Chief, farmers complain about effectiveness of chemicals in pest control long after application. When such situations come up, he takes from his files a bottle containing a sample of the material sold, identified for the particular customer, date of sale, etc. The sample is then sent for analysis to assure the farmer of the exact nature of his purchase and material applied earlier that season.

There is no doubt in Chief Jones' mind that when the farmer has

THE agricultural chemicals industry has for many years agreed that the dealer is and should be an even more prominent, and better informed factor in counseling farmers on what to buy, and when and how to apply chemicals, fertilizers etc.

The actual influence of the dealer, and the real extent of his technical knowledge of a highly specialized field, are subject to differences of opinion, with many experts holding the view that while the dealer should be an important source of information for the agricultural chemicals buyer, in actual practice, his knowledge of the products he is selling is often so limited that he may be dis-

*NAC meeting, Sept. 8-7, Spring Lake, N. J.



—about his store and his customers

questions about what to do to control a pest problem, he (the farmer) will come for advice to "the man who takes his dollar,"—the dealer! He also brings his complaints to the dealer when the control suggested doesn't work . . . So Chief Jones points out that, to protect himself, the dealer must be "mighty careful to give his customers the best break he can."

When asked about his sources of information, Chief Jones said he draws heavily on the insect control guide issued by the county agent, but at the same time expressed regret that this guide was not as up to date as the developments in the industry . . . due of course to the time required for approval, etc. The Chief said he was inclined to suggest materials which he knows have worked in the past. If control becomes more difficult, he normally suggests increasing the dosage of the same chemical . . . or perhaps trial of other chemicals which farmers in his area have found effective on similar crops. For example endrin was in use last year to control cabbage looper. This past season, when worms were particularly heavy, he suggested increasing last year's dosage of 2 to 1 to 3 to 1 (that is from two quarts per acre to three quarts per acre.) In Chief Jones' ter-

ritory, toxaphene gave early season control of thrips and fleahoppers; parathion and malathion were used some to control alfalfa clover aphid . . . and in this connection, the Chief said that control was not always obtained, in which case it was necessary to improvise on control measures.

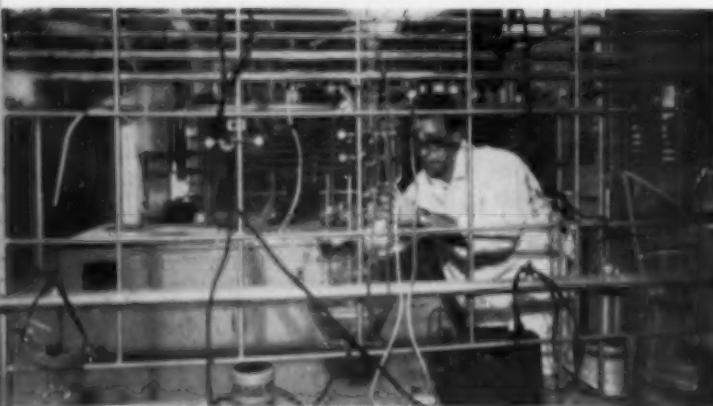
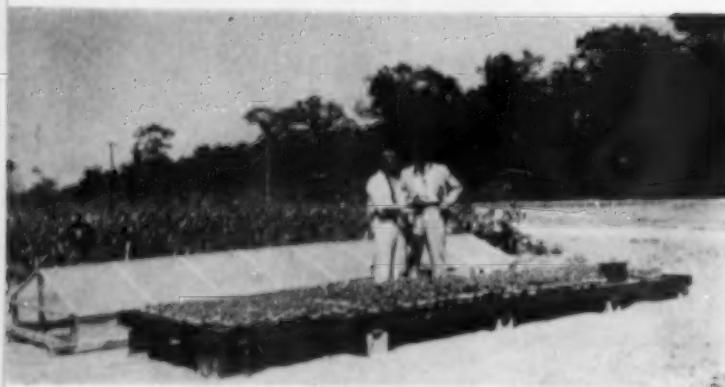
Like many dealers and users of agricultural chemicals, Chief Jones has a favorite insecticide. Being sold on the performance of this particular product, he tends to recommend it for a wide spectrum of control problems. It is rather difficult for a salesman to switch him to a competitive product, for he knows the performance of his favorite pesticide and hesitates to experiment in a situation where failure of alternate products to achieve control can result in heavy crop losses.

To sell him on a competitive product, it is necessary to demonstrate it convincingly in the field,—and the Chief indicates, that in his area at least, there have been few such demonstrations. From his experience, it would seem that the pesticide industry might well profit by the technique popularized by TVA,—supplying test quantities of new materials at a fraction of cost in order to demonstrate product performance to farm group leaders.

As indicated earlier, the Chief's operations are by no means typical of the average dealer, who is far too often lacking in any real knowledge of the nature of the materials which he sells,—how they are supposed to function, and when and how they should be used.

The average dealer conducting a small feed-seed-fertilizer-insecticide operation handles such an extremely wide variety of different materials, and is so busy with the inevitable detail of this type business, that it's not surprising that he finds little time remaining for real study of the many, and continually increasing types of chemicals with which he is expected to be thoroughly familiar.

There is no question that the farmer needs help in keeping informed, but it's uncertain as to how best to start doing this. It doesn't seem that educating the dealer is a practical solution . . . it's simply too big a job . . . although it would certainly solve the problem if it could be done. We wonder if the "crop doctor" theme might offer some solution . . . or some similar program offering the farmer services of a qualified, impartial expert completely familiar with agricultural chemical problems of local areas.★



OLIN

The main building of the Research and Development Laboratories of the Insecticide Division of Olin Mathieson Chemical Corp. Offices, library, and conference rooms are in the center section and on the second floor.

As part of an experiment to determine the sunlight stability of new fungicides, these cucumber plants are being exposed to August sunlight. A portable shelter made of polyethylene sheeting helps to protect the plants from dew and precipitation. Examining the plants are Dr. George L. Barnes, plant pathologist, and Dr. C. H. Hofrichter, Jr., manager of the Insecticide Division Research and Development Department.

A library conference at the laboratories. Dr. C. H. Hofrichter, Jr., department manager, discusses new fungicides developed at the laboratory with (left to right) T. A. Haney, Dr. Sylvan I. Cohen, and Dr. G. R. Mitchell. The library is a branch of the company's main research library at New Haven.

Anthony Introcassio, senior technician at the laboratories, is shown working on the development of a manufacturing process for a new foliar fungicide which the corporation will market.

Mathieson

A new biological testing station for O-M features facilities for field and laboratory testing; toxicity and product analysis

A NEW biological testing station, which gives Olin Mathieson Chemical Corporation one of the most integrated laboratories in the pesticides industry, has been completed at Port Jefferson, Long Island.

The testing station is an expression of the research and development laboratories, established at Port Jefferson in 1951 and serving the Insecticide Division, a major manufacturer and supplier of technical chemicals, liquid and powdered concentrates, synergized pyrethrum concentrates and pyrethrum extracts.

C. H. Hofrichter, Jr., of New Haven, Conn., manager of the research and development department, said the new facilities include a testing laboratory, greenhouse, control rooms, outdoor plots for field testing, and supporting offices, insect rearing rooms and utility rooms.

The new laboratory is designed and equipped to test chemicals for indications of biological activity against fungi, insects, bacteria and nematodes.

Plants will be maintained in the testing station greenhouse at various stages of maturity for inoculation with test organisms and treatment with candidate chemicals. It also will be used for insect rearing and testing.

A second greenhouse, newly constructed at the site of the original laboratory, will be used for testing growth regulators and herbicides.

The series of control rooms provide regulated light, temperature and humidity. Flats of growing plants in the control rooms are inoculated with disease organisms. Their effects on growing plants and the effectiveness of control measures are studied under various simulated climatic and seasonal conditions.

Headquarters for the Research and Development Department of the Insecticide Division is at New Haven,

Conn., in conjunction with the corporation's Chemical Research Organization and other Divisional Research Laboratories. Laboratory process synthesis and residue method development for the division are carried out at New Haven.

Candidate chemicals synthesized at New Haven are turned over to the Port Jefferson laboratories for further testing and development of manufacturing processes.

The new product development and engineering group at Port Jefferson plans field tests and demonstrations, conducts toxicity tests, and constructs and operates pilot manufacturing plants. A trace analysis group determines the quantity of chemical residue that remains on treated crops.

Areas of study are household
(Continued on Page 111)

Safe and Effective Application

THE manufacturers of the several organic phosphate compounds on the market have developed, organized and distributed, in addition to their labels, a large volume of technical information about their products: the hazards involved in their use and how to minimize them; modes of action on warm-blooded animals and insects; clinical data for quick reference by technical men and the medical profession; and such data has been issued in several languages. The United States Public Health Service and State agencies have produced helpful information and given the cause of safety much assistance. But poisonings continue to occur in moderate volume; and some of the most fantastic cases have involved loading and pilot personnel of aircraft applicators.

In one state the situation recently reached a new peak of highly publicized mis-information as to vital facts, resulting in some public clamor for prohibition of useful and necessary pesticidal compounds. And I am sorry to have to report that the headlines which were most damaging to public confidence appear to have originated with a medical doctor who, apparently, wanted some personal publicity.

One case involved a pilot whose death by crashing was charged at first to phosphate poisoning; it later developed that he had been on a big drunk. Two loaders were hospitalized because of terrific phosphate poisoning. It developed that they had spilled the liquid all over themselves while loading but had ignored all the many written and spoken warnings applicable to such cases. Another pilot made a poor landing, something broke and some remaining phosphatic liquid in the tank spilled over him—an occupational hazard just as is a brake failure on a logging truck going down a mountain road.

Paul B. Jarrett, M.D., operates a clinic in Phoenix, Arizona. He is a pilot himself and makes a specialty of determining cholinesterase levels and treating poisoning cases. He reported this one: "I saw a year ago in an airport restaurant a pilot who had been flying applying planes for

years, wearing a flying suit that was thick with parathion dust. His face, neck, arms and hands—even his eyebrows—were plastered with the dust. My conscience made me labor with that fellow over the situation (which was dangerous not only to him but to the other patrons of the restaurant) and I reminded him of the precautions outlined in several of my University extension courses. I again attempted to create in him some respect for that most potent chemical. His response was: "Hell, I've been putting this stuff on for years and it hasn't bothered me a bit!"

"That pilot collapsed on the job this summer—fortunately not while at the controls—and, with his loader, was rushed to a hospital with acute parathion poisoning. He just did make it through."

A blood sample was taken from a pilot who was applying organic phosphates. His cholinesterase level was so low that the laboratory hurriedly called for another blood sample to run a verification test. The pilot was informed about his low level. He continued to fly. Before the result of the second test could be known that pilot was stricken in flight and blacked out just after he landed. Should potent pesticide or the man be blamed?

There was the pilot who used a combination duster-sprayer rig with a large door on top. He cleaned its tank and the entire system with ammonia in an attempt to remove 2,4-D. He used water as a mixer for all chemicals. He poured in ten gallons of D.D.T. and seven gallons of water. The D.D.T. had been in five-gallon cans in the back of his car all day in 100° F. He wanted to check the level of his mixture so he shoved his head and shoulders into the tank—and lighted a match. The labels on the cans were RED and they read: "Keep away from fire, heat and open flame lights." First, second and third degree burns!

A pilot of long experience made a "dry run" to "check the air." He returned to the air strip and said the air was too rough to fly. He then loaded enough parathion to spray ten

acres and took to the air to, as he said, get the job out of the way, ignoring his own expert appraisal of the hazard. His opinion was correct. The rough air got him.

An agricultural aircraft control pilot arrived home after spraying a lot of parathion, wiped his boots with paper towels, and thoughtlessly tossed the towels into a waste basket in the bathroom. Later his 16-months-old child apparently got into the paper towels because she became seriously sick with all the symptoms of organic phosphate poisoning, including lowered cholinesterase. The hazard of contaminated wearing apparel and footwear is not only to the wearer; and those whose clothing must become contaminated should follow a well-thought-out system of protection for everybody.

A loader could not understand, he said, after he landed in a hospital, why he had become sick. All he had done, he explained, was to spill some technical parathion on his leather boots, splash some Systox technical into his eyes and use his respirator cartridge for more than a week!

A lady complained that a pilot had dumped a whole load of parathion dust on top of her house. During the investigation of the incident the pilot involved became indignant and testified: "I couldn't have done that; when I flew over that house I had my loader in the hopper!"

I shall not belabor you with more such incidents. Most of the cases of poisoning of aerial applicator personnel follow familiar patterns of

of Pesticides

Address presented October 30th
at the Dusting and Spraying
Conference, Marcus Whitman
Hotel, Walla Walla, Washington.

by C. O. Barnard*

Western Agricultural Chemicals Assn.

indifference to well-known hazards or gross and culpable carelessness not only on the part of employed personnel but by supervising operators who fail in their responsibility to give their employees adequate and forceful supervision.

One ground rig applicator of long and extremely successful experience—one whose operations consume around 200,000 pounds of 25 percent organic phosphates each year—has had almost no serious trouble. When an operative is employed, he is given this serious warning: "Our safety rules must be followed by everyone who works here. If they are not followed by you, you will be discharged immediately. And you must accept the periodic cholinesterase tests we provide for you."

I shall leave that phase of my talk by quoting Dr. Jarrett again: "How many of you who are present wear masks and protective clothing? Do you insist that your loaders wear protective clothing, goggles, gloves, respirators? Do you employers see that your pilots and loaders have periodic blood tests? Do you know that one-half of a c.c. of parathion technical absorbed through unbroken skin is a lethal dose for a man? How many of you carry atropine sulphate tablets? I knew (past tense) a pilot who knew that his cholinesterase was at a dangerous level, but he flew Systox and never recovered from a stall out of a deep turn, and so paid with his life for indifference." Should even the most potent pesticide be

charged with a fatal poisoning in such a case?

Many accidents to pilots in flight on application jobs have probably been caused by impaired vision and retarded mental and physical reactions due to lowered cholinesterase levels. And those lowered levels probably have in some cases been caused in part by repeatedly loading or helping to load organic phosphate compounds into their planes. Pilots should be forbidden by management to perform any part of a loading operation. In Arizona today State-backed regulations specify that "only loaders may fill dust hoppers or spray tanks; and pilots must not assist."

A long series of incidents in Arizona has resulted in what no one wants—more official regulation of our businesses. There are 20 separate sections under Rule 17 of the Rules and Regulations applying to the Arizona Pesticide Law. They were recently ordered by the State Applicators Board. If they are not effective in lessening the incidence of poisonings more drastic legislation will ensue.

Whose fault will it be? Whose fault if insurance rates to the aerial applying industry are spiraled upward?

Now for the other phase:

A manufacturer shipped a certain applicator's hangar 15 tons of a liquid defoliant for the account of a cotton grower. Long after all prescribed acreage had been treated,

nearly 3,000 pounds of the shipment were found in the applicator's hangar by a representative of the manufacturer. The operator admitted that the material belonged to the grower; but he had not informed the owner that it had not been used. His explanation was that he always held back some material "to take care of re-applications of spots where the job didn't look so good." In this case, he said, there had been no need for re-applications so he was just long on the material! The delivered tonnage had been based on the recommended dosage per acre. A different applicator now works for that grower. What has it cost that applicator because of confidence destroyed?

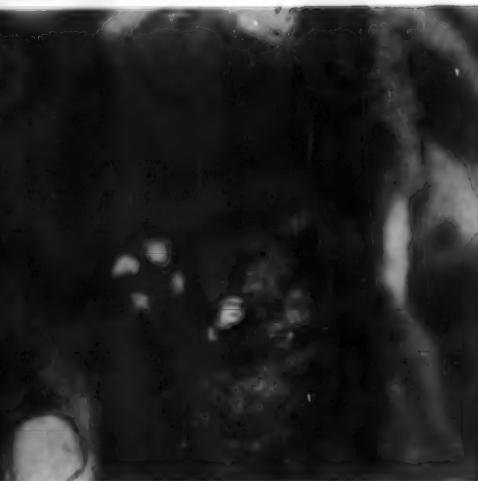
A technical representative of one of the largest producers of organic phosphates recently declared: "It is a wonder that any pesticide can maintain its good reputation!" He had just observed some loadings and applications of parathion, Systox and aldrin. None of the loaders had worn masks; the chemicals were spilled on clothing and arms. And in the middle of an afternoon, in 105° F., a pilot flew Systox. How much of the small gallonage of that product applied per acre could reach the crop in such heat?

An inspector of a state department of agriculture was alert and caught a pilot applying dieldrin in a wind velocity of 20 m.p.h. Another pilot applied a dinitro and oil defoliant to seed alfalfa, made wide turns over adjacent celery fields without proper cut-off of the pesticide; and much of the celery had to be paid for.

In another case, the normal dosage of 2,4-D was applied by plane to a huge rice acreage. There were plantings of tomatoes on three borders and pears on the fourth. Need I tell you what happened? When called in by the State on charges, the operator admitted that his senior pilot had refused to do the job because of the drift factor, so he had given the task to a junior! That operator learned who was responsible.

Then there are the instances of trouble due to inadequate field mark-

(Continued on Page 111)



Brown ticks in the ear of a heifer. Mazabuka, Northern Rhodesia.

Cattle Tick

Part 2

(Part 1 appeared in November, p. 32-34)

SIX series of experiments were conducted to determine residual activity of the then available insecticides on cattle under Central African conditions. The practical usefulness of the relatively expensive newer insecticides depends considerably on allowance of a longer interval between treatments. Groups of cattle were hand sprayed very thoroughly once, then pastured in paddocks heavily infested with brown ticks, *Rhipicephalus appendiculatus*. Note was taken at regular intervals of blood engorgement as well as total number of attached ticks to determine length of

protection period. Tables 3 and 4 present partial data. In brief, none of the treatments gave protection longer than one week. Again, the difficulty of tick control in Central Africa is demonstrated by the large numbers of ticks attached within one week regardless of treatment. By two weeks, no great differences could be found between treated and controls at these severe paddock infestation levels.

Blue tick, *Boophilus decoloratus* resistance was studied by laboratory dipping of engorged females in insecticide emulsions and subsequent

observations of mortality and per cent of ticks able to oviposit. Table 5 presents selected data. The Zambesi strain was obtained from African owned cattle in a remote region where insecticides had never been used. The susceptibility to BHC and DDT was evident. The Veterinary and Allanson strains were highly BHC resistant, and the Wienand strain evidenced DDT resistance also. The BHC resistant strains were not well controlled by toxaphene, aldrin, dieldrin, or arsenic. Unfortunately insufficient numbers of "primitive" ticks were available to make a thorough comparison of susceptibility to all the chlorinated hydrocarbons.

In Northern Rhodesia, a split dipping schedule was suggested, including 0.17% to 0.25% toxaphene weekly during the rainy season (bont and brown ticks and disease incidence most important), and 0.14% to 0.2% DDT fortnightly during the long dry season (blue tick control most important). BHC at 0.1% gamma, or preferably 0.15% gamma is still effective and cheap for dipping African cattle where resistance has not occurred. Spray racing is most effective by 0.25% toxaphene, but 0.17% can be used to reduce costs. For power pen spraying African cattle, 0.17% toxaphene is effective. To reduce costs to a minimum 0.2% gamma BHC may be used as a power pen spray, but is much less effective.

Formulation Performance

ANALYSIS of organic dips is a prerequisite to correct practical use, as well as a necessity in determin-

TABLE 3.
Rainy Season Residual Activity Experiment
Tick Counts Per 5 Animals

Treatments	1 Week After Treatment Flat	Engorged	2 Weeks After Treatment Flat	Engorged
Group 1				
Unsprayed	299	0	950	149
.16% arsenic trioxide	225	0	800	163
.05% gamma BHC	192	0	833	102
.5% DDT	240	0	813	145
.5% toxaphene	225	0	813	135
.2% chlordane	190	0	900	148
.1% aldrin	186	0	700	102
.1% dieldrin	199	0	900	154
.1% heptachlor	208	0	750	112
Group 2				
Unsprayed	188	83	192	27
.16% arsenic trioxide	202	77	225	23
.05% gamma BHC	86	19	130	22
.5% DDT	120	33	167	32
.5% toxaphene	62	4	147	31
.5% chlordane	61	2	141	43
.2% aldrin	82	3	120	24
.2% dieldrin	127	13	167	43
.2% heptachlor	82	7	123	11

Control

By J. G. Matthysse

ing experimentally performance of insecticides and formulations. Most failures in practical use are due to low concentration in the dipping vat. One of the most important contributions to effective tick control that could be made was to enable accurate dip vat analyses to be conducted in Central Africa. Analysis methods in use in Kenya, the Union of South Africa, and the United States were considered for adaptation to conditions at Mazabuka, Northern Rhodesia. For chemical analysis, a Beckman pH meter was purchased for electrometric chloride titration.

The benzene hexachloride method used finally was a modification of the method then in use in Kenya, substituting an electrometrically titrated chloride blank for steam distillation. The method is a simple aqueous sodium hydroxide dehydrochlorination of a 50 ml. dip sample. The method in use by Klipfontein Organic Products in South Africa for DDT was used with only minor necessary equipment modifications. Alcoholic potassium hydroxide was used for partial dehydrochlorination of a 50 ml. dip sample. Toxaphene was analyzed both by sodium metal total chloride and by specific gravity. The main difficulty with the total chloride method is complete drying of the dip sample, finally accomplished by pipetting 25 ml. of dip onto two long strips of filter paper and drying in a box, through which air currents were forced by an ordinary fan. Three dryings of 5, 5, and 2½ ml. per paper were required to accommodate the sample, after which the sample was xylene soxhlet extracted. The Veterinary Department of the Union of South Africa suggested this method. The laboriousness of

toxaphene chemical analysis led to the adoption of the specific gravity method of the African Explosives and Chemical Industries Ltd. of South Africa. An 80 ml. dip sample emulsion is broken by lead nitrate, the toxaphene solution taken up in kerosene with the aid of acetone, clarified with lead nitrate sulfated castor oil solution, and the specific gravity difference with kerosene read. Although such specific gravity methods have been devised as "vat-side" methods, under Central African conditions they are appropriate only for laboratory use.

Use of specific gravity methods for DDT and BHC were investigated, using xylene as the medium. Extraction into a smaller volume and use of smaller hydrometers or a specific gravity balance is necessary, as the tank concentrations to be determined are commonly 0.05% to 0.15% in contrast to 0.17% to 0.25% for toxaphene. Also, the specific gravity method could be used in conjunction with chemical analysis (alcoholic dehydrochlorination) to assay the all too common mixed BHC-DDT tanks. The

Dipping European owned beef cattle.
Lochinvar Ranch, Northern Rhodesia.



Spray race treating experimental group of cattle.
"X" on back is a treatment group paint mark.



TABLE 4.
Dry Season Residual Activity Experiment
Tick Counts Per 5 Animals

Treatments	1 Week After Treatment Flat	Treatment Engorged	2 Weeks After Treatment Flat	Treatment Engorged
Group 1				
Unsprayed	39	0	47	18
.025% gamma BHC	35	0	42	19
.25% DDT	2	0	41	12
.5% DDT	7	0	25	12
.25% toxaphene W.P.	19	0	47	21
.25% toxaphene Emul.	24	0	48	18
.5% toxaphene Emul.	3	0	34	7
.05% dieldrin	29	0	30	12
.1% dieidrin	12	0	30	11
.1% aldrin	27	0	39	15
Group 2				
Unsprayed	670	171	2000+	500
.05% gamma BHC	595	23	2000+	390
.5% DDT	520	20	2000+	327
.5% toxaphene	533	3	2000+	450
.5% chlordane	490	0	300	250
.2% aldrin	335	0	450	280
.1% dieidrin	286	2	430	230

TABLE 5.
In-Vitro Tick Dipping Experiments to Determine Resistance
Boophilus decoloratus Females

	Per Cent Ticks Alive 3 Days	Per Cent 17 Days	Per Cent Oviposition
Zambesi Non-Resistant			
.0625% gamma BHC	0	0	0
.25% DDT	17	0	22
Veterinary Resistant			
.0625% gamma BHC	95	65	30
.25% DDT	80	45	45
.625% DDT	57	1	6
.25% toxaphene	92	60	55
.625% toxaphene	95	40	25
.25% dieldrin	83	45	20
.25% aldrin	85	38	35
.25% $As_3 O_3$	93	80	48
Allanson Resistant			
.1% gamma BHC	98	68	43
.25% DDT	84	76	36
.625% DDT	58	16	2
.25% toxaphene	98	89	82
.625% toxaphene	96	76	40
Wienand Resistant			
.1% gamma BHC	99	55	65
.25% DDT	100	77	93
.625% DDT	79	26	43

analysis methods are presented in full in the Report on Tick-Borne Diseases (Matthysse 1954).

A government dip analysis service was initiated using the above methods, and it is hoped that expansion of this service will increase the effectiveness of organic dips in Central Africa. The main stumbling block is proper sampling, as improper vat mixing or allowance of any settling completely invalidates the analysis. During the dipping experiments described previously, vat analysis was conducted regularly. Through analysis of settled tank top samples and bottom samples (mud), before and after weekly dipping, it was found that all formulations of DDT and BHC settled or adsorbed to the mud. Mud samples from emulsion vats were 25 to 30 times as concentrated as top samples. The toxaphene emulsion vat contained only 3 times the concentration in the mud as in the top. The supposed emulsion could not be washed out of the mud with water, indicating solid particles or strong adsorption. Since mud and excreta fouling is severe under Central African conditions, there is little justification for use of most of the more expensive emulsions as the actual insecticide rapidly assumes the physical properties of suspensions. Also, selective removal by the hair coat tended to reach a constant value as the vat aged, regardless of formulation. Initially, benzene hexachloride emulsions and toxaphene suspensions showed the most severe selective removal. Microscopic examination of dip samples indicated that the solvents in common DDT and BHC formulations in use in Africa evaporated to a considerable extent, partially producing suspensions of discrete crystalline insecticide. In general, 50% increase in topping up strength was found necessary to maintain vat concentration, but great variation occurs according to season and individual vat.

Cost Comparison of Insecticides and Application Methods

THE low value of beef, hides, and milk in Central Africa places a firm ceiling on tick control costs.

(Continued on Page 121)



Agricultural Ammonia Institute Elects Stewart

General Ralph Wooten, retiring president greets newly elected president Fred Stewart.

MORE than 500 anhydrous ammonia producers, distributors, and equipment manufacturers from 38 states and Canada, attending the sixth annual convention of the Agricultural Ammonia Institute, were urged to expand efforts to broaden markets for anhydrous ammonia and keep pace with production developments.

Maj. Gen. Ralph H. Wooten, Mid-South Chemical Corp., Memphis, Tenn., retiring president of the AAI, told the members to sell harder rather than engage in price-cutting to end the present surplus production capacity of ammonia and nitrogen.

The four-day convention, which was adjourned on Nov. 9, heard Gen. Wooten urge greater educational efforts to increase the use of NH_3 . This year's convention site was the Biltmore Hotel in Atlanta.

Fred Stewart, Agricultural Ammonia Service, Santa Paula, Calif., topped a new slate of officers elected at the opening session and will succeed Gen. Wooten as president. Other officers elected were: Paul Deusterhaus, Deusterhaus Farm Supply Co., Fowler, Ill., first vice president; Charles Corken, Corken's Inc., Oklahoma City, Okla., re-elected second vice president; Mike H. Carter, Farmers Supply Cooperative, Greenwood, Miss., re-elected secretary; and Murray O. Rasberry, Delta Butane Gas and Fertilizer Co., Helena, Ark., re-elected treasurer. Jack F. Criswell, Memphis, Tenn., continues in the position of executive vice president and Frank E. Jordan was introduced as executive assistant of the Institute.

Ivy Duggan, vice president of the Trust Company of Georgia and

former U. S. Farm Credit Administration governor, kicked off the convention by declaring that "Industry can show no such record of efficiency" as can the American farmer.

"If it weren't for increased farm production efficiency the plight of the farmer would be much worse than it is today," according to Mr. Duggan who noted that, "We would be spending much more for food (which takes a smaller share of income in the U. S. than in any other nation) than we are today."

He pointed out, however, that benefits of more efficiency are going to the public, not the farmer. Farm income (including housing and food consumption on the farm) has been declining faster than farm population, Mr. Duggan declared. He said per capita income of farmers slipped from 62.8 per cent of the nonfarm average

in 1948 to 45.5 per cent last year.

Mr. Duggan suggested that the future Southern farm income potentials lie in higher yields of cash crops through better production practices, including the wider use of fertilizer. He concluded his remarks by pointing out that banks and other credit agencies are making increased use of research findings. He summarized a list of eight conclusions gained from talks with bankers in Georgia and urged that the fertilizer industry keep each banker informed on the optimum uses of fertilizers in his area. "Bankers have considerable influence on the quantities of fertilizer that their customers buy," Mr. Duggan said.

Jack F. Criswell delivered the Institute's staff report for 1956. He cited weather conditions—too dry and wet; rain at the wrong time prevent-

(Turn to Page 107)

Left to right: (seated) Paul Deusterhaus, Deusterhaus Farm Supply, Fowler, Ill.; Fred Stewart, Agricultural Ammonia Service, Santa Paula, Calif.; M. H. Carter, Farmers Supply Cooperative, Greenwood, Miss.

(back row) Frank Jordan, executive assistant AAI William M. Hunt (repre-

senting Charles Corken second VP) of Corken's Inc., Oklahoma City, Okla. J. M. Porter, American Cyanamid, N. Y. Mrs. Hazel Harris, administrative assistant AAI; Murray O. Rasberry, Delta Butane Gas & Fertilizer Co., Helena, Ark. General Ralph H. Wooten, retiring president, Mid South Chemical Corp., Memphis, and Jack Criswell, executive VP.



WITHIN recent years a number of synthetic organic materials have been introduced for the control of various species of mites troublesome in orchards. One of the more effective materials made available is p-chlorophenyl p-chlorobenzene sulfonate. It was first introduced by the Dow Chemical Co. for field testing in 1949 under the code K-6451. Subsequently the material has been sold as a 50% powder under the trademark name of Ovotran Wettable and the active ingredient is now known by the common name of *ovex*.

When first tested, in some instances the material was used at the rate of 1½ lb. of the wettable powder in 100 gallons of spray mixture. This concentration was effective in controlling orchard mites but injury to the fruit and foliage occurred occasionally, especially when the material was applied at the end of the blossom period or within approximately a week after this period. In addition to this limitation some of the earlier formulations used imparted off-flavor to the fruit. Apparently this situation developed only when applications were made within a few weeks of harvest. It was a transitory effect, generally, being detected at picking time but tending to disappear after the fruit had been held several weeks in storage.

In an attempt to overcome these deficiencies the manufacturer considered changes in the manufacturing process leading to greater purification of the basic chemical, and to means of improving the commercial formulation. A further consideration was the possibility of using the material at lower dosages and in multiple applications. Concerning the last plan, it was established that mites could be controlled effectively in a low dosage four-spray program starting just prior to the blossom period. A dosage of ¼ lb. of the 50% wettable powder in 100 gallons of water was used in the pre-blossom treatment and ½ lb. in the three subsequent sprays. This basic schedule and some modifications of it have been tested in the present experimental programs.

In 1954, five agencies elected to conduct a coordinated study to determine whether or not various formulations and treatment programs of *ovex* produced off-flavors or otherwise altered the quality of the fresh or processed fruit. These were the co-operating agencies: Entomology Research Branch, Agricultural Research Service, U.S.D.A., Vincennes, Indiana; Ohio Agricultural Experiment Station, Wooster, Ohio; New York State Agricultural Experiment Station, Geneva, N.Y.; The Dow Chemical Co., Midland, Michigan; and the Beech-Nut Life Savers, Inc., Canajoharie, N.Y.

The general plan of the experiment was as follows: Each agency, except Beech-Nut Life Savers, Inc., selected suitable blocks of apple trees and applied a similar series of *ovex* treatments. While it was planned to use somewhat the same series in all

of the localities represented, there were some deviations from this schedule which are noted in Table 1. At harvest 2-bushel samples were taken from each plot and these were assembled and transported to the Beech-Nut Life Savers, Inc., for processing into applesauce. The product was packed in standard 5-ounce glass jars. The processed samples were subsequently brought to the New York State Agricultural Experiment Station where they were taste evaluated. In addition to these evaluations, Beech-Nut Life Savers, Inc., made independent taste analyses, but this study was limited to those lots which received the maximum dosage of *ovex* in each series. *Ovex* chemical analyses were made also of the same samples that were taste evaluated. Analyses were made before and after processing.

Pertinent information on the sub-experiments conducted in each

Table 1. Some information on the varieties, dates treatments were applied and samples harvested.

Location	Apple variety	Application No. and Date					Date fruit harvested
		1	2	3	4	5	
Vincennes, Ind.	R. Delicious	4/12*	5/13	6/11	7/14	7/23	8/16 9/22
Wooster, Ohio	Stayman	—	5/14	6/17	7/27	8/16	— 10/18
Geneva, N. Y.	R. I. Greening	—	6/7	6/29	7/30	8/16	— 9/21-22
"	20-Ounce	—	6/7	6/29	7/30	8/16	— 9/21-22
South Haven, Mich.	Jonathan	—	6/1	6/28	7/26	8/13	— 9/27
"	G. Delicious	—	6/1	6/28	7/26	8/13	— 10/8
"	"	5/18**	6/2	6/29	7/26	8/13	— 10/8

*One plot only, applied in pre-blossom bud stage.

**All plots, applied in petal-fall stage.

Table 2. *Ovex* residues on raw and processed apples.*

Location	Apple variety	Ovex formulation	Ounces applied**	Residue in ppm†	
				Raw apples	Applesauce
Vincennes, Indiana	Red Delicious	Ovotran	.40	.58	.00
" "	"	M 346	.40	.58	.00
" "	"	M 347	.40	.57	.00
Wooster, Ohio	Stayman	Ovotran	.32	.38	.00
" "	"	M 346	.32	.08	.00
" "	"	M 347	.32	.29	.00
Geneva, N. Y.	R. I. Greening	Ovotran	.32	.46	.00
" "	"	M 346	.32	.71	.00
" "	"	M 347	.32	1.15	.00
" "	Twenty-Ounce	Ovotran	.32	1.06	.00
" "	"	M 346	.32	.95	.17 (cloudy)
" "	"	M 347	.32	1.01	.00
South Haven, Mich.	Jonathan	M 347	.32	1.17	.00
South Haven, Mich.	Golden Delicious	Ovotran	.36	.31	.00
" "	"	M 346	.36	.45	.00
" "	"	M 347	.36	.75	.00
" "	"	M 348	.36	.50	.00

*Residue analysis made in the Food Laboratories of the Beech-Nut Life Savers, Inc.

**Represents total ounces of 50% wettable powder formulation applied in seasonal program.

†Check or blank value subtracted.

TASTE EVALUATION of apples treated with the ACARICIDE OVEX

By S. E. Lienk,* E. J. Abeling,** P. J. Chapman*
C. R. Cutright† D. W. Hamilton,†† O. H. Hammer†

locality is presented in Table 1. The rates at which ovex formulations were used in each spray schedule are given in Table 3. In each locality, insecticide-fungicide treatments were applied at 10-14 day intervals during the test period, starting at the end of blossoming and continuing until mid-August. For the most part ovex was included in the spray mixture in alternate treatments of this general spray program. During this post-blossom period the fungicides used were captan and ferbam while the insecticides were DDT and lead arsenate.

Four formulations containing ovex were tested. These included the commercial grade of Ovotran available in 1954, and formulations containing ovex obtained by 3 methods of purification of the product used in commercial Ovotran, designated as M-346, M-347 and M-348.

Results of the chemical analysis of ovex residues on the fresh and processed apples of 17 of the 36 plots are given in Table 2. The analytical

method used is that described by Gunther and Blinn.* The residue figures given represent the net values, i.e., the blank or check reading has been subtracted from each analysis. As will be seen, ovex residues on the fruit prior to processing ranged from .08 to 1.17 ppm. with most samples falling within the range of .4 to .7 ppm. The present tolerance of ovex residues on fresh apples established by the Food and Drug Administration is 3 ppm. No ovex was recovered from the applesauce samples with one possible exception.

In all, 56 samples of applesauce were taste evaluated. In instances where doubt existed as to the difference or lack of difference the sample was re-run. Members of the taste panel were recruited from the staff of the Department of Entomology and the Department of Food Science and Technology of the New York State Agricultural Experiment Station. The roster ranged from 13 to 24 with an over-all average of 18 tasters. These persons were trained tasters in the sense that they have had

experience in evaluating the flavor of a number of products.

For evaluating flavor differences the triangle taste test was employed, using the score sheet shown in Figure 1. Results of these evaluations are given in Table 3. In the triangle test 3 samples are evaluated at one time. Two of these are identical although the pair selected by the individual conducting the panel might be either the treated or untreated. The first requirement of the taster is to pair like samples. Secondly, between these 2 classes, he is asked to indicate which product he prefers in general taste, and the degree of this difference, if any, is noted. Finally, the sample is graded with regard to off-flavor. Since in general no definite off-flavors were detected these scores are not included in Table 3. (page 48).

The significance of the data obtained in Table 3 is based on applications of a graph presented by Gray, Stone and Atkin.* Here the percentage of correct selections needed for three levels of significance is plotted against the total number of tests.

Discussion of Results

As even a cursory examination of the data in Table 3 will reveal, no consistent preference was exhibited by the tasters for samples obtained from the treated plots over the untreated or vice versa. This leads to the conclusion that the treatments had no direct effect on flavor. If it is permissible to average the scores made for the entire experiment, we find support for this conclusion. Thus 42.8% of the judges preferred the treated, 43% favored the check and 14.2% had no choice.

Granting the foregoing conclusion, there remains the question of what accounts for the differences that were detected by the tasters. A number of possible explanations occur to the writers, and these are enumerated below. It should be said, however, that none of these effects were noted at the time the fruit samples were

(Continued on Page 117)

*New York State Agr. Expt. Station.
**Beech-Nut Life Savers, Inc.
†Ohio Agricultural Experiment Station.
††Fruit Insect Laboratory of Entomology Research Branch, Agricultural Research Service, U. S. D. A.
*Dow Chemical Co.

*Gunther, F. A. and Blinn, R. C. Analyses of insecticides and fungicides. Chemical Analyses 6. Pages 388-391, 1956.

Gray, P. B., Stone, L., and Atkin, L. Systematic study of the influence of oxidation on beer flavor. Wallerstein Laboratory Communications, 10 (81) 188-198, 1947.

Table 3. Results of flavor evaluation of apples treated with the acaricide ovex.

Test Material	No. applications (oz. in 100 gal.) ¹						No. tasters	Triangle Test			No. with correct pairings favoring			Order of Difference (Column 4 - Fig. 1)			
	1	2	3	4	5	6		No. correct	Significance	Treated	Check	No. Choices	0	1	2	4	
Rhode Island Greening — Geneva, N. Y.																	
Ovotran	—	8	8	8	—	—	19	13	***	4	9	0	0	10	3	0	
"	—	8	8	16	—	—	18	10	n.s.	2	5	3	4	6	0	0	
"	—	8	8	8	8	—	18	11	*	3	5	1	1	8	2	0	
M 346	—	8	8	8	—	—	21	12	* ^a	5	5	2	1	8	3	0	
"	—	8	8	16	—	—	21	14	**	9	9	0	2	10	2	0	
"	—	8	8	8	8	—	20	9	n.s.	4	3	2	3	6	0	0	
M 347	—	8	8	8	—	—	19	4	n.s.	2	2	0	0	3	1	0	
"	—	8	8	16	—	—	20	16	***	1	15	0	1	6	5	4	
"	—	8	8	8	8	—	19	11	*	4	5	2	3	8	0	0	
Twenty-Ounce — Geneva, N. Y.																	
Ovotran	—	8	8	8	—	—	21	6	n.s.	2	5	1	1	6	1	0	
"	—	8	8	16	—	—	15	9	*	4	3	2	6	3	0	0	
"	—	8	8	8	8	—	19	10	n.s.	7	2	1	3	5	2	0	
M 346	—	8	8	8	—	—	19	11	*	8	2	1	1	10	0	0	
"	—	8	8	16	—	—	19	10	n.s.	2	6	2	2	7	1	0	
"	—	8	8	8	8	—	20	8	n.s.	3	4	1	1	6	1	0	
M 347	—	8	8	8	—	—	19	7	n.s.	3	4	0	2	5	0	0	
"	—	8	8	16	—	—	13	10	***	4	5	1	0	7	2	1	
"	—	8	8	8	8	—	18	9	n.s.	3	4	2	2	4	3	0	
Stayman — Wooster, Ohio																	
Ovotran	—	8	8	8	—	—	17	6	n.s.	4	2	0	4	2	0	0	
"	—	8	8	16	—	—	20	13	**	6	6	1	3	9	1	0	
"	—	8	8	8	8	—	20	14	***	3	7	4	9	9	0	0	
M 346	—	8	8	8	—	—	16	9	B.B.	2	6	1	3	5	1	0	
"	—	8	8	16	—	—	17	12	***	3	7	2	1	10	1	0	
"	—	8	8	8	8	—	19	16	***	6	8	2	2	10	4	0	
M 347	—	8	8	8	—	—	24	17	***	10	6	1	2	9	6	0	
"	—	8	8	16	—	—	16	11	*	3	4	4	3	7	1	0	
"	—	8	8	8	8	—	19	8	n.s.	4	3	1	1	7	0	0	
Red Delicious — Vincennes, Ind.																	
Ovotran	4	8	8	16	16	—	20	11	*	6	3	2	6	4	1	0	
"	—	8	8	8	8	—	20	10	n.s.	2	6	2	1	8	0	0	
"	—	8	8	8	8	8	20	10	n.s.	6	1	3	4	4	2	0	
M 346	—	8	8	8	8	—	21	14	**	3	8	3	3	8	2	1	
"	—	8	8	8	8	8	20	12	*	6	5	1	3	6	3	0	
M 347	—	8	8	8	8	—	19	11	*	6	3	2	5	5	1	0	
"	—	8	8	8	8	8	18	9	n.s.	4	3	2	5	4	0	0	
Jonathon — South Haven, Mich.																	
Ovotran	—	8	8	8	—	—	20	11	*	6	3	2	2	8	1	0	
"	—	8	8	16	—	—	20	11	*	5	3	3	7	3	1	0	
"	—	8	8	8	8	—	20	15	***	7	5	3	5	7	3	0	
M 346	—	8	8	8	—	—	20	9	n.s.	4	2	3	3	5	1	0	
"	—	8	8	16	—	—	22	8	n.s.	6	2	0	7	1	0	0	
"	—	8	8	8	8	—	19	11	*	5	6	0	2	8	1	0	
M 347	—	8	8	8	—	—	20	11	*	3	7	1	2	9	0	0	
"	—	8	8	16	—	—	18	9	n.s.	2	3	0	0	5	0	0	
"	—	8	8	8	8	—	17	7	n.s.	3	3	1	3	4	0	0	
Golden Delicious — South Haven, Mich.																	
Ovotran	—	8	8	8	—	—	13	10	**	6	3	1	2	4	4	0	
"	—	8	8	16	—	—	15	11	***	1	6	4	3	7	1	0	
"	—	8	8	8	8	—	17	10	*	4	5	1	1	6	3	0	
"	4	8	8	8	8	—	12	6	n.s.	2	2	2	4	2	0	0	
M 346	—	8	8	8	—	—	17	12	***	8	4	0	1	7	6	0	
"	—	8	8	16	—	—	20	9	n.s.	2	6	1	2	6	1	0	
"	—	8	8	8	8	—	19	17	***	15	2	0	0	3	12	2	
"	4	8	8	8	8	—	16	9	n.s.	5	4	0	0	6	2	1	
M 347	—	8	8	8	—	—	18	11	*	7	3	1	3	5	3	0	
"	—	8	8	16	—	—	19	8	n.s.	3	4	1	3	4	1	0	
"	—	8	8	8	8	—	18	7	n.s.	2	4	1	2	4	1	0	
"	4	8	8	8	8	—	13	3	n.s.	2	1	0	0	3	0	0	
M 348	4	8	8	8	8	—	18	9	n.s.	5	2	2	4	5	0	0	

¹Amounts refer to ounces of 50% ovex wettable powder formulations.^aSignificant at 5% level.^{**}Significant at 1% level.^{***}Significant at 0.1% level.

FERTILIZER INDUSTRY ROUND TABLE MEETING

Conclusion of *Agricultural Chemicals* report of Conference

SPEAKING before the Fertilizer Industry Round Table at its meeting, October 16-18, Shoreham Hotel, Washington, D. C., Walter Horn, of the Missouri Farmers Association described their new fertilizer plant at Joplin, Mo. The plant, designed by Dorr-Oliver Co., Stamford, Conn., is a high analysis pelletizing unit with a capacity of 72,000 tons per year. Principal compounds manufactured are phosphoric acid, ammonium phosphates, and ammonium sulfate. The phosphoric acid is produced by the wet process.

Mr. Horn gave details of six primary sections in the plant: rock unloading and grinding, phosphoric acid production, fertilizer production, product storage, bagging and shipping, and water treatment. A series of photographs of installations illustrated production operations. In the manufacture of ammonium phosphate fertilizer, Mr. Horn reported that temperature is controlled by the evaporation of moisture in the slurry and supplemented with low pressure of air when necessary. Fertilizers made in the unit include: 13-39-0, 16-48-0, 14-14-14, 14-28-14, 12-36-12, 19-19-0, 19-38-0, 11-48-0, and 16-20-0. (The complete text of Mr. Horn's talk, and photographs of operations at the Joplin plant will appear in the next issue of *Agricultural Chemicals*).

About Bags and Bagging

APANEL discussion on bagging involved such topics as "What's in the bag?", research in the bag industry, packages—packaging materials—handling costs" . . . when representatives from several bag companies talked with members of the Round Table. Participating in the panel were W. Jacobi, Union Bag and Paper Co.; J. M. McDonald, Bemis Bros. Bag

Co.; K. A. Arnold, St. Regis Paper Co.; and O. W. McDuffie, International Paper Co.

The disappearance of low priced unskilled labor, together with increased materials costs has made economical and efficient materials handling imperative, observed W. Jacobi in reviewing cost factors—And in the fertilizer industry, he continued, one of the biggest jobs is bagging. After discussing several factors to be considered in the selection of bag type . . . sewn open mouth, sewn valve, pasted open mouth or pasted valve,—Mr. Jacobi observed that filling and closing is one of the functions by which the greatest economies can be effected. He noted that economies can be effected by carload purchases, correct sizing of bags, etc. . . . but that trying to economize by using a lighter basis weight than is practical, or doing away with a moisture barrier will only lead to trouble.

Mr. Jacobi reviewed costs of the various bag types, listing them as \$100.16 for sewn open mouth, \$108.50 for sewn valve, \$103.50 pasted open mouth, \$105.11 pasted valve bags. He indicated that in his opinion, sewn open mouth bags allow for greater economy, greater speed of production, and better closure than valve bags. He listed one advantage of the valve bag as not requiring a sewn closure or sewing operator.

Mr. Jacobi concluded his remarks with the statement that the cost of bagging materials and the cost of bagging itself may mean the difference between a profit or loss in today's market. With the introduction of the 50 lb. unit, the cost of bagging has increased, he said, and every effort should be made to obtain more efficient methods of bagging and handling by those in this industry.

"What's in the bag?" asked R. J. McDonald of Round Table members, as he pointed out that a bag offers two prime functions. "A bag is not an end product by itself, but is rather a means of transporting a manufacturer's product from the production plant to the market place. More than this, a properly designed bag of quality is a valuable aid to a manufacturer in selling his product for maximum profit."

"A particularly valuable service provided by bag suppliers is brand design and printing. Leaders in the bag industry maintain art departments which are staffed by trained and skilled artists who have an expert knack for designing customer's brands for the greatest eye appeal. Printing presses for reproducing these special designs on bags are unique, as are certain means for making plates and other steps in the total process. Research is being conducted at all times to improve known techniques and existing equipment."

A further discussion of research activities in the pulp, paper and packaging industry was presented by K. A. Arnold, who advised that general objectives in research and development are:

1. To develop new processes to maintain the profit margin between rising manufacturing costs and stable selling price.
2. To develop new products to diversify and expand into more profitable fields, in order to increase company income and to increase our services to customers.

Mr. Arnold reported that recent research has produced frictionizing coatings which prevent stacks of bags from slipping on trucks and in warehouses. New types of end closure for

(Continued on Page 111)



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Soil Bank Analysis by E. L. Butz Highlights Meeting of Midwest Soil Improvement Committee

AN 82½ percent increase in fertilizer use in the states where the Middle West Soil Improvement Committee operates was reported at the committee's annual business meeting in Chicago Oct. 25. A highlight of the meeting was an estimate, offered by Earl L. Butz, Assistant Secretary of Agriculture, indicating that, while the national soil bank program will decrease fertilizer consumption by some 930,000 tons, the net result from use on substitute crops and for other purposes, will be to increase demand for fertilizer by some 350,000 tons over present consumption.

- (1) Earl L. Butz, U. S. Dept. of Agri. and W. M. Newman, Price Chem.
- (2) Russell Pisle, Sohio Chem. Co.; Geo. C. Kempson, Monsanto Chem. Co.; Geo. W. Cosper, Sohio Chem. Co.
- (3) R. D. Tayloe, Nat'l. Potash Co.; Cash Cahill, Nat'l. Potash Co.; Miel McClannan, St. Regis Paper Co.
- (4) John Sanders, Mississippi River
- Chem. Co.; Cecil H. Fluty, Farm Belt Fert. & Chem. Co.; C. Ray White, Spencer Chem. Co.
- (5) R. E. Bennett, Farm Fert. Inc.; E. R. Martin, Miami Fert. Co.; John Zigler, Int. Min. & Chem.; James L. Schell, Kingsbury & Co
- (6) R. W. Wildon, U. S. Potash Co. and W. B. Copeland, Smith-Douglass.

R. E. Bennett of Farm Fertilizers, Inc., Omaha, Nebr., was elected president of the Middle West Committee for the 1956-57 term. Other officers elected were Robert E. Fitzgerald, Smith-Douglass Co., Inc., Streator, Ill., as vice president and L. E. Quiram, Illinois Farm Supply Co., Chicago, as treasurer.

New directors elected include Marshall Smith, Smith Agricultural Chemical Co., Columbus, O., Merle Blue, Consumers Cooperative Association, Kansas City, Mo., and W. W. Venable, Corn Land Plant Foods, Grinnell, Ia. Mr. Bennett, the new

Officers and directors of Middle West Soil Improvement Committee. Seated, (l to r)—L. E. Quiram, treasurer; R. E. Bennett, president; R. G. Fitzgerald, vice-president; W. M. Newman, retiring president. Standing, (l to r)—Z. H. Beers, Executive secretary; G. H. Kingsbury, retiring treasurer; W. W. Venable, E. T. Potterton and Merle Blue, directors. (MWSIC directors not shown in above picture are: Marshall Smith, J. D. Stewart, Jr. and D. A. Williams.)

president, and Mr. Fitzgerald, new treasurer, also became members of the board.

Z. H. Beers, MWSIC executive secretary, reviewed what has been accomplished through the project committee's grants-in-aid work with state colleges in Michigan, Ohio, Kentucky, Missouri, Minnesota, Iowa and Indiana. In 1957, he said, a highly important research project will be launched in Indiana, dealing with pasture improvement to increase beef production. A memorandum of understanding has also been signed with Ohio State for a project which will utilize radio active tracers to determine what happens to nitrogen when put into the soil. Minnesota station is expected to sign shortly for another project concerned with the effect of organic matter on the soil. Various projects in the other cooperating states will be continued and the entire project program, Mr. Beers declared, should turn out to be a very profitable investment for the industry.

Mr. Butz, in his address on "Your Balance In the Soil Bank Program," said that any appraisal made at this early date of effects on fertilizer consumption of the administration's soil bank program must necessarily be highly speculative. It is a national estimate which does not allow for local or regional variations, he pointed out, and emphasized that participation in the soil bank plan is entirely voluntary on the part of every individual producer.

(Continued on Page 112)





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FERTILIZER

Views and News

By *Vincent Sanchelli*



Gibberellins — Latest Growth Accelerators:

AMAZING discoveries among hormones and enzymatic substances are becoming quite common. The latest, gibberellic acid, is causing a furor in agricultural circles. Sprayed as a solution or applied on a plant in a paste mixture, it causes the plant to grow two or three times taller than normally. Linear growth is not the only effect: during the early stages of growth of the soybean and snap-bean plants, for example, both the weight and the solid matter in them were increased 30 to 40 per cent.

This amazing substance called gibberellin is produced by a fungus, *Gibberella*. It was first observed by Japanese scientists in rice culture, where it causes the elongation of rice shoots. An aqueous concentration of the chemical ranging from 1 to 50 parts per million or one millionth of an ounce in 1 ounce of water is sufficient to produce the accelerated growth within 3 to 4 weeks.

Already plant scientists are excitedly speculating on how to utilize the gibberellins—3 different kinds are believed to exist—in the improvement of economic crops. Tests are being made in private and governmental laboratories. Ornamentals, vegetable and field crops, young forest trees—are all being surveyed. The object of many studies at the U. S. Department of Agriculture is to find out if it may be possible to give some plants the advantage of increased height in their competition with other plants. Perhaps it may be possible to

treat young tree seedlings to give them an early start in the nursery, or it may be possible to cause pulpwood trees to grow faster. Many plants in the seedling stage are subject to disease attacks, the peanut, for example being one, and it may turn out that the peanut seedling can be induced to grow fast enough to escape this dangerous stage. Forage crops may be induced to increase their total dry weight as happened when soybeans were treated with gibberellic acid. Time will tell how gibberellins will affect our agricultural economy. One effect is evident at present: this discovery is influencing research in other allied fields. Extracts of higher plant seed—corn, beans, peas—are reported to stimulate growth in dwarf strains of corn. This response is almost identical with that from gibberellic acid. Chemists are at present trying to isolate and identify the chemical responsible for this effect. Since gibberellic acid is currently very scarce this other source, if identical, may increase the supply for both research and applied use.

Importance of Public Relations

FARMERS generally have not been blessed with favorable publicity. As one result, most city people continue to believe that federal farm policies subsidize farmers to a point where they become a direct cause of high food prices. These urban critics do not bother to study the economics of our agriculture but accuse "the always-grumbling farmer" of getting rich at tax-payers' expense. That this

attitude is not exclusive to the American scene is revealed by comments in British journals occasioned by a report this spring of the Ministry of Agriculture on "Farm incomes in England and Wales, 1953-54." This report discussed "farm income" and differentiated this item from *farmers' income*—a difference as real as that between revenue and margin of profit. Since food is dearer in the United Kingdom now than when prices were government-controlled, the British urbanite is inclined to believe that farmers are profiting. When British newspapers commenting on the Report emphasized in headlines and copy that British farm income had advanced by some 22%, factory and office workers were quick to infer that local farmers were profiteering. They demanded that price supports be removed. A careful study of the report, however, would have shown that farmers' net income—the difference between what it costs to produce and the market price—had not risen as the headlines in the newspapers had heralded it. Things which farmers had to buy for production purposes had increased substantially during the period while farm prices had dropped.

Carelessness in interpreting farm news items is not confined to British journalists and commentators. We see it in American papers too. Whereas a professional economist would comprehend the term "income" accurately, the general public understands by it the sum of dollars and cents one earns and is available for personal needs and savings. Therefore, this should be explained to mean "net income."

Farmers' incomes in the United States are and have been too unstable. Farm prices and net farm income have been declining since 1951 despite government support prices. Many factors cause this: Variations in crop yields due to climate, diseases and pests, changes in national income, changes in the export and domestic market, changes in national food preferences—these are some of the major ones.

If newspaper and magazine editors were more careful, when writing

new source of high quality lime ... quicklime and hydrate

West End, supplier of quality chemicals for over 31 years, proudly announces expansion of its hydrate and quicklime production. Discovery of an extensive deposit of high grade limerock resulted in the construction of a large new processing plant. The photo shown here is of the giant 340 foot rotary kiln. The plant will soon be producing increased quantities of highest quality lime to serve the needs of growing western industry.

We suggest you give consideration to West End as a primary source of supply. Inquiries and your specifications are invited.



West End Chemical Company

DIVISION OF STAUFFER CHEMICAL COMPANY
EXECUTIVE OFFICES, 1956 WEBSTER, OAKLAND 12, CALIF. PLANT, WESTEND, CALIF.
SODA ASH • BORAX • SODIUM SULFATE • SALT CARE • HYDRATED LIME

"catchy" headlines, to acquaint their readers with the more prosaic facts of the farm economy, a more sympathetic understanding of our farm problems might result. Agriculture, and this includes the fertilizer industry, needs to cultivate better public relations and to do the job constantly.

About Potash Fertilizers

ORDINARILY when a soil tests low or deficient in potash, the corrective is to apply and work into the soil a potash salt. We learn, however, from that eminent British soil scientist, Dr. E. W. Russell, that this corrective does not work in all cases. He cites Danish and Dutch research showing that heavy applications of potash fertilizer do not correct potash-deficient soils. These scientists have found that not until the applied potash has distributed itself evenly over the soil particles can crops utilize it as a nutrient. Added potash distributes itself quite slowly. For example, in the Netherlands study, potatoes grown in a potash-deficient soil and receiving 400 pounds of 60% muriate of potash per acre had leaves which tested a very low potash content. This soil was cropped moderately. The Danish work showed much the same result, and led the scientists to recommend that it is better to treat a moderately low potash soil with a very heavy dressing of potash fertilizer (800 lbs. of muriate) once every five years, than a lighter dressing (100-200 lbs.) per year.

Now, here is Dr. Russell's significant observation: The massive and occasional dressing with potash fertilizer holds good only for soils of a low potash status. Soils already having a high potash content, if treated with the massive 800 lb.-per acre rate, would respond with greatly reduced yields. Apparently, in order to do its job satisfactorily, the potash fertilizer must become thoroughly incorporated with the soil, otherwise the current crop cannot make best use of it.

Does this theory explain, I wonder, the attitude of a number of agronomists of the Corn Belt, who advocate the broadcasting of potash

fertilizer on cornland in the fall rather than in the spring as the preferred practice? The theory they express is that the spring application of muriate tends to suppress the uptake of phosphorus. Perhaps Dr. Russell's theory is the truer explanation of the lowered yields: the crop cannot utilize the added potash in the spring, because it has not had sufficient time to distribute itself evenly on the surface of the soil particles. Furthermore, the band placement of the fertilizer does not favor a quick uniform distribution throughout the root zone. Many of the soils in this region are also low in potash. This European idea deserves careful investigation by American agronomists.

Parakeratosis

THIS is another of those mouth-filling words coined by the professional, which is well-understood by the hog raiser if not by the generality of men. It is interesting to observe how in recent years the farmer has accepted the jargon of the professional service man, and easily accepts and freely uses big technical words that describe disease symptoms or other conditions. On the farm, parakeratosis is one of those words. It describes a certain skin condition developed by hogs when the diet is deficient in some mineral, which we now know is zinc. How zinc deficiency was proved to be the cause is an interesting story and is one more evidence of the vital role so-called minor elements play in the health and vigor of all living organisms.

Scientists at the Michigan State University investigated the cause of this hog disease. A series⁵ of tests were carefully conducted to find out the interrelationships of minerals in the ailment. Rations containing varying amounts of calcium, phosphorus and zinc were fed to each of four different lots of pigs. The results emphasized that a high mineral level in the diet predisposed the animal to parakeratosis; that it was important to maintain a proper level of calcium and phosphorus in the ration, and lastly, that the ratio of zinc to the calcium and phosphorus levels was a

very important factor. Further study of the role of zinc is promised. Research at the University of Missouri, confirms these findings.

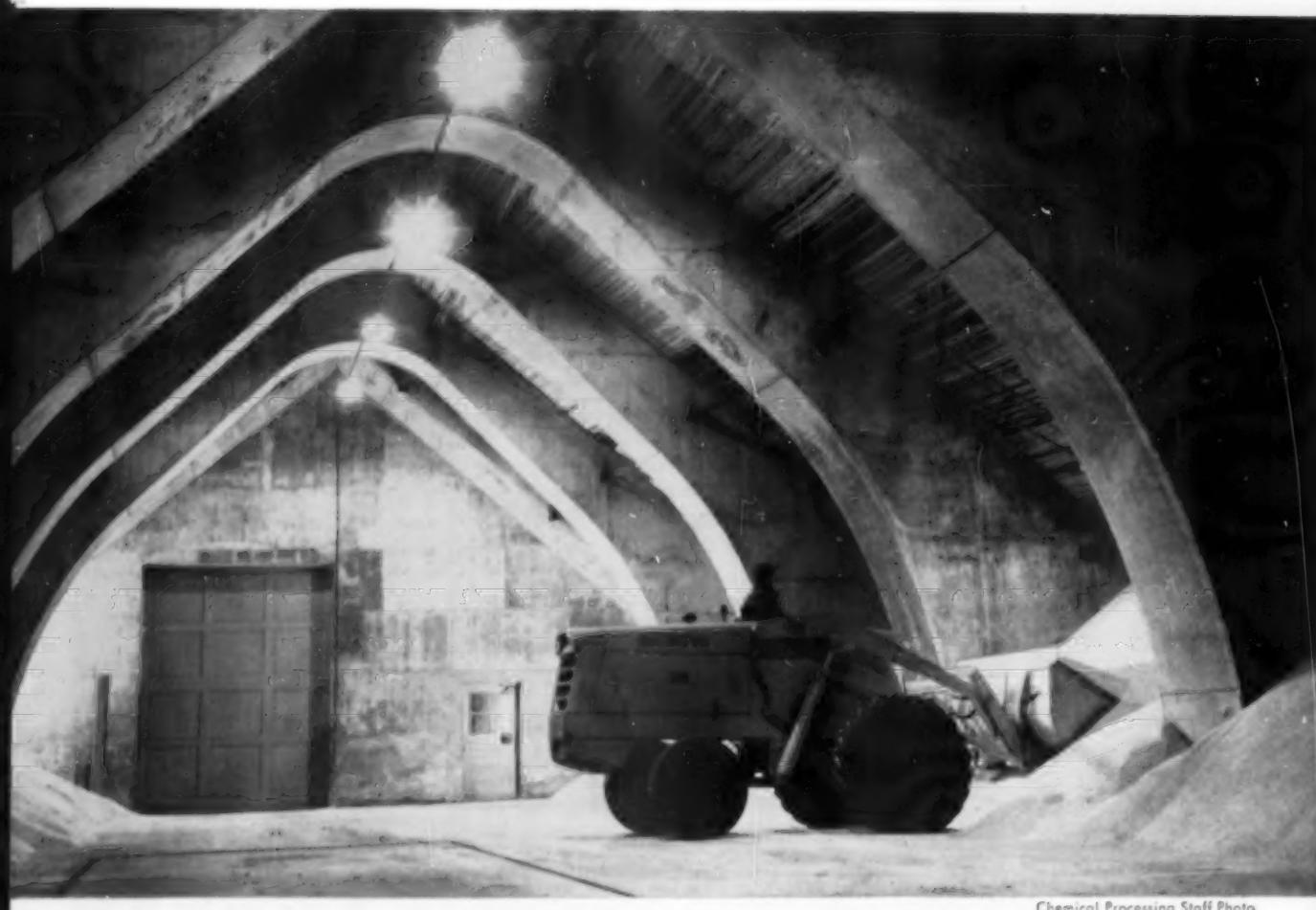
More About American Farm Units

THE changes occurring in the average size of American farms have been referred to previously. The 1954 Census of Agriculture has released figures recently which emphasize this change and suggest that the fertilizer manufacturer in studying his sales market should consider the quality as well as the number of farm units. During the period 1950-54 the number of farms was reduced by 600,000 and about 1,000,000 farm workers left agriculture for work elsewhere. But look what happened: the average size of American farms increased by 27 acres, man hours of farm work dropped 3%, and the output per man hour spiraled to the highest recorded level. For example, the average per-farm yield of soybeans increased by 28%, corn by 11%, wheat by 9% and oats by 19%.

The main factors favoring these remarkable gains have been the use of fertilizers of higher plant food content, better crop varieties, and powered machines. American farms are becoming industrial units with machines replacing the declining labor force. One farm tractor and equipment now can prepare and plant three acres of corn in the same time that it takes animal power to cover one acre, and the experts tell us it is possible to work round the clock with mechanized equipment at a rate seven times as fast, as with animal power—assuming it were feasible to employ animals on a 24-hour schedule. The extent of this mechanization on the farms of this country is shown by these census figures: at the end of 1955 American agriculture had 18 billion dollars invested in farm machinery and motor vehicles — 4 billion more than in 1950. About 70% of this mechanical equipment was on farms in the Mississippi Basin, principally the Corn Belt, the country's so-called "bread basket." In that "heart-land" of the country lie the

(Continued on Page 117)

⁵"Journal of Animal Science, Vol. 15, No. 2, May 1956."



Chemical Processing Staff Photo

60,000 tons to distribute yearly; lots as small as 25 lbs.

International Salt Company chooses Michigan for rehandling job in new Chicago warehouse

This world-famous company, largest producers of salt in America, have a tremendous material-handling problem at their recently-completed, completely-modern warehouse in Chicago. Into this huge, arched, cathedral-type building 178 feet long, 162 feet wide, and 70 feet high comes 60,000 tons of salt a year. All of it—120,000,000 pounds, in 10 different types and sizes—has to be re-handled for shipment. Some lots run 50 tons or more each... some are as small as 25 pounds. One tractor shovel does *all* re-handling from stockpiles, feeding the salt, on order, to centrally-located weigh hoppers for bagging or bulk shipment (same unit also loads bulk salt, at times of peak demand, directly into trucks).

Tractor Shovel is key to operation

In selecting this tractor shovel, so important to the entire operation, prime considerations were:

1. Large capacity

2. Speedy handling
3. Utmost safety and
4. Low maintenance costs.

In the opinion of International Salt Company officials, *only one machine passed ALL tests with flying colors: a Michigan Tractor Shovel!*

Chosen from 6 models

With six basic models, 44 to 165 hp, and buckets from 6 cubic feet to 5 cubic yards, to choose from, International Salt Company picked the 80 hp, 1 cubic yard, bucket wheel drive Model 75B you see here.

This unit, like all Michigans, gives International Salt the efficiency only a matched all-Clark-designed and built power train can give. No-clutch shifting to change speeds and direction at the flick of a lever. Power steering. Shock absorbing torque converter with 3-to-1 torque multiplication. Forward and reverse speeds to 26 mph. Adequate power and weight, plus low-level rollback and low-level-carry, to get and

deliver heaping loads. Utmost safety, with big brakes and excellent all-around visibility. Planetary axles which *completely eliminate axle breakage*.

See Michigan in action

No matter what kind of bulk material *you* have to handle—fertilizer, foods, sand, or chemicals—these Michigan features are well worth checking. It's simple to do. Write or call us any time. We'll be glad to help you analyze which size Tractor Shovel best fits your needs... then show you that machine in action, in your plant, doing the jobs you want to see done!

Michigan is a registered trade-mark of

CLARK EQUIPMENT COMPANY
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Spread and New Finds of Some Insects in the U. S. in 1956



This column, reviewing current insect control programs, is a regular feature of AGRICULTURAL CHEMICALS. Mr. Dorward is head—Plant Pest Survey Section, Plant Pest Control Branch, U. S. Department of Agriculture. His observations are based on latest reports from collaborators in the U.S.D.A.'s pest surveys throughout the U. S.

By Kelvin Dorward

DURING 1956 insects continued to show their ability to not only spread in this country but to enter from foreign areas. The insect which perhaps received the most publicity and attention during the year was a pest that at one time had been eradicated from this country but has again invaded our land. The Mediterranean fruit fly, a serious pest of certain fruits and vegetables, which in 1929 was found in central Florida and eradicated by July of the following year at an estimated cost of over \$7,000,000 in April of 1956 was found in the Miami, Florida, area. Immediately upon finding the infestation an intensive Federal-State survey and eradication program was initiated. The pest has now been found in 28 Florida Counties but in many of these counties the infestations have been spotty or localized. By the last of October the eradication program had reduced the known infested area from a high of approximately 750,000 acres to approximately 170,000 acres. No Mediterranean fruit flies have been found in this country outside of Florida.

The insect known to be in this country prior to 1956 showing the most spectacular spread was the spotted alfalfa aphid, a very destructive pest of alfalfa. This pest was first found in the United States in 1954 and had invaded 14 States west of the Mississippi River by the end of 1955. The first report of the spotted alfalfa aphid east of the Mississippi was that of a collection from Alachua County, Florida. The State of Mississippi was next to report an infestation. Since then the aphid has been found in Illinois, Wisconsin, Indiana, Kentucky, Tennessee, Alabama, Georgia, South Carolina, North Carolina, Virginia and West Vir-

ginia. North of the States known to be infested in 1955 the aphid was found this year in South Dakota, Iowa and Minnesota. Also being reported for the first time in several new States was the sweet clover aphid. Although the first collection in this country was made in 1948 during this year the aphid was reported from widely separated States. First reports were received in 1956 from California, Idaho, Illinois, Kentucky, Mississippi, Missouri, New Jersey, New York, North Dakota, Pennsylvania, South Dakota, Texas, Virginia and Wisconsin.

The Mexican fruit fly, a pest of citrus, was taken again in California this year. This insect, which has been in the Rio Grande Valley of Texas for a number of years, was first taken in California in 1954. A program, designed at eradication, was initiated in California and Baja California, Mexico. It was not until May of this year that the fly was again found in California. The eradication program continues and only three flies have been taken this year in California, all within less than two miles of the Mexican Border at Tijuana. Only eleven flies have been taken this year in northern Baja California, Mexico.

The melon fly, a very destructive pest of some vegetables and fruits, was taken in the United States this year but to-date survey results have been more encouraging than with some of the other introduced pests. A single specimen of the pest, an insect not known to be established in the Western Hemisphere, was taken in a trap in July on the campus of the University of California at Los Angeles. Extensive scouting and the use of more than 8,000 traps in the area have failed to reveal additional specimens.

At Houston, Texas, in July a

species of termite (*Coptotermes crassus*) was taken from a dry dock and upon examination was found to be a very destructive tropical species not known previously in this country. Continued survey has failed to find additional infestations in the United States and the infested timbers are being removed and burned.

Several other insects were reported in 1956 as having been taken for the first time in the United States. Among these was a bostrichid (*Sinoxylon ceratoniae*) taken in Hollywood, California, from furniture which had been manufactured in Egypt for a movie set and returned to this country for storage. The furniture was fumigated and the infestation destroyed. From Florida came the first record of the leaf footed bug (*Leptoglossus stigma*) in this country. The insect was collected during June in Dade County, from lychee, a nut becoming widely used in the preparation of certain foods. The first report of the aphid (*Myzaphis bucktoni*) in this country came from Maine where the pest was collected in September from swamp rose. A tortricid (*Acleris lipsiana*) was collected in Oregon cranberry bogs during September for the first United States record of the pest. Food plants of the insect in Europea include *Myrica* and *Vaccinium*.

Several insects heretofore known to be in the United States were reported from additional States in 1956. The yellow margined leaf beetle, a pest primarily of crucifers, first reported in this country in 1947 from Mobile County, Alabama and prior to this year also known to be in Mississippi and west Florida was found in Louisiana. California reported finding for the first time the grain beetle (*Pharaxonontha kirschi*). This insect was previously known to be in Texas and Illinois. The Rhodes grass scale, an insect attacking grasses, which has been known to be in Texas and several Southeastern States was reported from Arizona in August. An eriophid mite (*Vasates masalongoi*) was taken in August in the State of Washington for the first time.

The giant hornet (*Vespa crabro*

(Continued on Page 105)

LISTENING

Post

Effects of Organic Fungicides and Antifungal Antibiotics On Mushroom Mildew and Lipstick Mold

This department, which reviews current plant disease and insect control problems, is a regular monthly feature of **AGRICULTURAL CHEMICALS**. The comments on current plant disease problems are based on observations submitted by collaborators of the Plant Disease Epidemics and Identification Section, Horticultural Crops Research Branch, U. S. Department of Agriculture, Beltsville, Md.

By Paul R. Miller

ROBERT N. Goodman, of the University of Missouri, reports results of a 2-year series of experiments to control mushroom mildew, caused by *Dactylium dendroides*, in a commercial establishment at Hermann, Missouri. The plant had been a winery, with underground cellars which were adapted for mushroom growing. The installation is said to be one of the best in Missouri. It is isolated from other mushroom-producing areas, being 100 miles from the nearest commercial plant. Previous history of *Dactylium* had been erratic with respect to severity and occurrence in a given house.

In 1955, the mildew first became evident in January, and reached epidemic proportions by late February. In some of the affected houses production was prematurely curtailed. The preparations used in the experiments were:

Acti-dione (cycloheximide), produced by the Upjohn Company

Acti-dione in aerosol bombs at concentrations of 1% and 0.5%. The bombs also contained 7% acetone, 7% Velsicol, and 2 pounds methyl chloride (CH_3Cl); they were formulated by Dr. Wm. Klomparens of the Upjohn Company. The aerosol was dispensed at the rate of 4 seconds per 1000 cubic feet.

Anisomycin, Rimocidin, and Oligomycin, produced by Charles Pfizer Co.

Griseofulvin, produced by Merck & Co.

Terraclor (pentachloronitrobenzene), produced by Olin Mathieson Chemical Company.

Dowicide A (o-phenyl phenol, sodium salt), produced by Dow Chemical Company.



In the first experiments, set up in March 1955, Acti-dione was applied as a bed drench at 2.6 ppm and as an aerosol. The aerosol did not seem to be effective. Where the bed-drench was applied, surface spread of the pathogen stopped and no further growth took place in already established spots. About 2 weeks after the Acti-dione was applied warm weather ensued. Spread of the disease in the untreated check areas stopped and no new outcroppings of mycelial growth developed. It was therefore impossible to determine specifically whether the Acti-dione had been effective in preventing new growth of the fungus. It was obvious, however, that the antibiotic drenches had inactivated established mycelial pads of *Dactylium*.

During the 1956 season mildew became evident in mid-March. Replicated plots were set up employing the following antibiotics: Acti-dione at 2.6 ppm; Anisomycin, Griseofulvin,

Rimocidin, and Oligomycin, all at 100 ppm. The antibiotics were applied as bed drenches through the conventional watering apparatus.

Each antibiotic was applied to four separate patches of mildew and the area immediately surrounding each patch. The individual plot size was approximately 9 square feet. Numerous untreated mycelial mats of the mildew fungus in the beds where the antibiotics were applied served as controls. These treatments were planned to determine the effects of the antibiotic on established patches of mildew, extent of spread from the original affected site, and occurrence of new surface growth within the confines of the treated area.

Results of this experiment are summarized as follows:

- (a) Acti-dione and Anisomycin inactivated established areas of *Dactylium* for about 10 days.
- (b) Following this 10-day period, the fungus resumed growth in the original site and also in the surrounding treated area.
- (c) Rimocidin, Griseofulvin, and Oligomycin were not effective.
- (d) No phytotoxic effects were observed on mushrooms coming up in the treated areas or on mushrooms already present at the time of treatment.

These results led to a second experiment in which replicated plots of 25-foot lengths of mushroom bed were treated with Acti-dione and Anisomycin at 2.6 and 100 ppm, respectively. By this time the pathogen had become exceedingly active and was spreading rapidly over the beds.

Again Acti-dione and Anisomycin were observed to afford only temporary inactivation of the pathogen. A plan to try repeated applications at weekly intervals of these partially effective antibiotics was abandoned in view of the recent report of Stoller, West and Bailey (given in last month's "Listening Post") of the excellent results obtained from the use of Terraclor and Dowicide A.

When the third experiment was begun, the disease was rampant in beds that had just been reloaded and had yielded more than 1 pound per square foot in the first two breaks.

HOW UNION MULTIWALLS BUILD MORE
BUSINESS FOR THE FERTILIZER INDUSTRY

**"I insist on fertilizer
in Multiwall bags," says
world champion
corn grower**

*Willard C. Kirk, farmer,
Jeffersonville, Ohio*

"Science rules on my farm," says Mr. Kirk, winner of many "ten ears" awards and trophies. "I rotate strictly so as not to rob my soil—soybeans and oats, one year each; pasture, two years; then corn, one year. I use lots of fertilizer, and prefer it packed in 80-lb. Multiwalls. I find Multiwalls easy to handle and store, and to open and empty completely. Also, fertilizer does not sift out of these paper bags."

Union fosters science on the farm

Many farmers, like Mr. Kirk, get tips on fertilizer use through the information program of Union Bag-Camp Paper Corporation, which provides basic data for newspapers, magazines, and radio and television stations.

Union's country-wide educational program is designed to increase fertilizer consumption. More and more of the output of this growing industry is being marketed in Union Multiwall bags.

As farmer and dealer preference for fertilizer-in-multiwalls continues to grow, so does manufacturers' preference for Union Multiwalls.

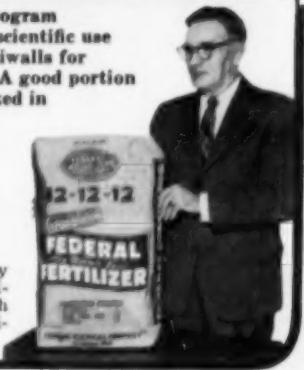
Are you completely posted on all the recent advances in multiwall packaging of fertilizer? We will be glad to show you some of the new Union sacks the industry is now using so successfully.



"Union's information program will help farmers in the scientific use of fertilizer. Union Multiwalls for fertilizer help them too. A good portion of our production is packed in Union Multiwalls."

*Mr. John R. Sargent,
Vice President
in Charge of Sales,
Federal Chemical Company,
Louisville, Ky.*

Federal Chemical Company supplies America's "bread-basket" with fertilizer, much of it packed in Union Multiwall bags.



UNION Multiwall Bags

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UNION BAG-CAMP PAPER Corporation • 233 BROADWAY, NEW YORK 7, N. Y.

Dactylium was equally intense in re-cased beds containing exceedingly active spawn from which no breaks had yet been harvested. The two organic fungicides were applied to triplicated 30-foot lengths of mushroom bed at concentrations of 1000 ppm and 500 ppm.

The following is a summary of the results from the Terraclor treatments:

- (a) At either 500 or 1000 ppm the established mats of *Dactylium* were inactivated, as evidenced by the collapse of the mycelial tufts.
- (b) As a result of a single application, only occasional new growth of mildew developed in the treated area during the succeeding 6-week period following cropping.
- (c) The new mats that did appear were small and did not increase in size.
- In addition, mycelial growth from *Dactylium* on cap and stalk of an occasional mushroom did not extend into the casing soil.
- (d) The isolated appearances of the pathogen in treated beds were attributed primarily to poor coverage. It is believed that best results were obtained where the casing soil was wet to a depth of at least $\frac{1}{2}$ inch with the 1000 ppm concentration.
- (e) No injury to mushrooms was observed at either concentration.
- (f) Although yield data were not obtained, there appeared to be no unusual reduction in yield in the treated beds.
- (g) Even in treated spots mushrooms did not form where *Dactylium* had been present.

The following is a summary of results obtained with Dowicide A:

- (a) The single application of this material at 500 or 1000 ppm inhibited further development of *Dactylium* for about the same length of time recorded for Actidione and Anisomycin.

(b) Mushrooms that broke through the casing soil of the Dowicide A-treated plots showed an undesirable brown discoloration.

- (c) This injury was apparent at both concentrations and was evident the day following the application.

As it became evident that the results with Terraclor reported by Stoller and his associates were being duplicated, this material was applied at the 1000 ppm rate to all houses still in production. Many of these houses were showing the disease by this time in various degrees of intensity. The results of these final applications were in all instances highly effective in controlling *Dactylium dendroides*.

Of additional interest was the observation that a fungus, *Geotrichum* sp., commonly referred to as "lipstick mold" was effectively controlled by Terraclor. Lipstick mold has been present in the houses where these studies were conducted for the past 2 years, and has also been observed in mushroom houses in the Kansas City area. It is a weed fungus that restricts its growth to the surface of the casing soil. In the fruiting stage it takes on the characteristic red coloration from which its name is derived. When this mold first appears on the bed surface it is very similar in appearance to mushroom spawn. It has been noted also that wherever this mold is present, mushrooms fail to break through the casing soil.

Geotrichum appeared at about the time when all houses still in production were being treated routinely with Terraclor. Soon afterward it became evident that Terraclor was effective not only against mildew but against lipstick mold as well. From limited observations only, there is some reason to believe that if this fungus is inactivated shortly after it appears on the beds it does not seriously affect "break-through" of mushrooms.

During the past cropping season sodium hypochlorite at 10 ppm was routinely added to the water applied to the beds. The occurrence of *Dactylium*

dendroides in epidemic proportions and the more than occasional growth of lipstick mold support the conclusions of others that chlorinated water has little or no effect upon these two mushroom pathogens. ★★

Winter Grain Mite Control

The winter grain mite (*Penthaleus major* (Duges) has damaged fall-sown small grains in northcentral and central Texas. Infested fields have a grayish or silvered appearance, caused by the removal of juices and chlorophyll from the leaves, with consequent reduction in forage during the fall and winter and reduced yields of grain.

The mites hatch in the fall from aestivating eggs and are present in infested fields in Texas throughout the winter. Cold temperatures and moisture are necessary for their development. The mites die with the approach of hot weather in the spring. Two generations a year have been observed. Most of the feeding is done at night or on cloudy days, and small grains or grasses are favored hosts, but the mites have been observed on vegetables and weeds. Little preference is shown for wheat, oats, or barley.

Fields continuously in small grains are most heavily infested. Crop rotation has greatly reduced or eliminated damage by this mite, and is recommended to the grower.

The phosphorus compounds, parathion, TEPP, Systox, Metacide, and malathion gave satisfactory control of the mite at relatively low dosages. The organic compounds, Sulphenone, Ovex, and Aramite also showed promise of controlling the mite. In sprayed fields, one application of either parathion or TEPP at $\frac{1}{4}$ pound per acre gave seasonal control of the mite. Either of these acaricides or malathion at the same dosage is recommended for the control of the winter grain mite in small grains.

"Biology of the Winter Grain Mite and Its Control in Small Grains," by Harvey L. Chada. In *Journal of Economic Entomology*, Vol. 49, No. 4, August, 1956.

THE INDEX

TO THIS VOLUME HAS BEEN REMOVED
FROM THIS POSITION AND PLACED AT
THE BEGINNING OF THE FILM FOR
THE CONVENIENCE OF READERS.

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dendroides in epidemic proportions and the more than occasional growth of lipstick mold support the conclusions of others that chlorinated water has little or no effect upon these two mushroom pathogens. ★★

Winter Grain Mite Control

The winter grain mite (*Penthaleus major* (Duges) has damaged fall-sown small grains in northcentral and central Texas. Infested fields have a grayish or silvered appearance, caused by the removal of juices and chlorophyll from the leaves, with consequent reduction in forage during the fall and winter and reduced yields of grain.

The mites hatch in the fall from aestivating eggs and are present in infested fields in Texas throughout the winter. Cold temperatures and moisture are necessary for their development. The mites die with the approach of hot weather in the spring. Two generations a year have been observed. Most of the feeding is done at night or on cloudy days, and small grains or grasses are favored hosts, but the mites have been observed on vegetables and weeds. Little preference is shown for wheat, oats, or barley.

Fields continuously in small grains are most heavily infested. Crop rotation has greatly reduced or eliminated damage by this mite, and is recommended to the grower.

The phosphorus compounds, parathion, TEPP, Systox, Metacide, and malathion gave satisfactory control of the mite at relatively low dosages. The organic compounds, Sulphenone, Ovex, and Aramite also showed promise of controlling the mite. In sprayed fields, one application of either parathion or TEPP at $\frac{1}{4}$ pound per acre gave seasonal control of the mite. Either of these acaricides or malathion at the same dosage is recommended for the control of the winter grain mite in small grains.

"Biology of the Winter Grain Mite and Its Control in Small Grains," by Harvey L. Chada. In *Journal of Economic Entomology*, Vol. 49, No. 4, August, 1956.

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concentration, lower cost-per-ton in
production of **PHOSPHORIC ACID**

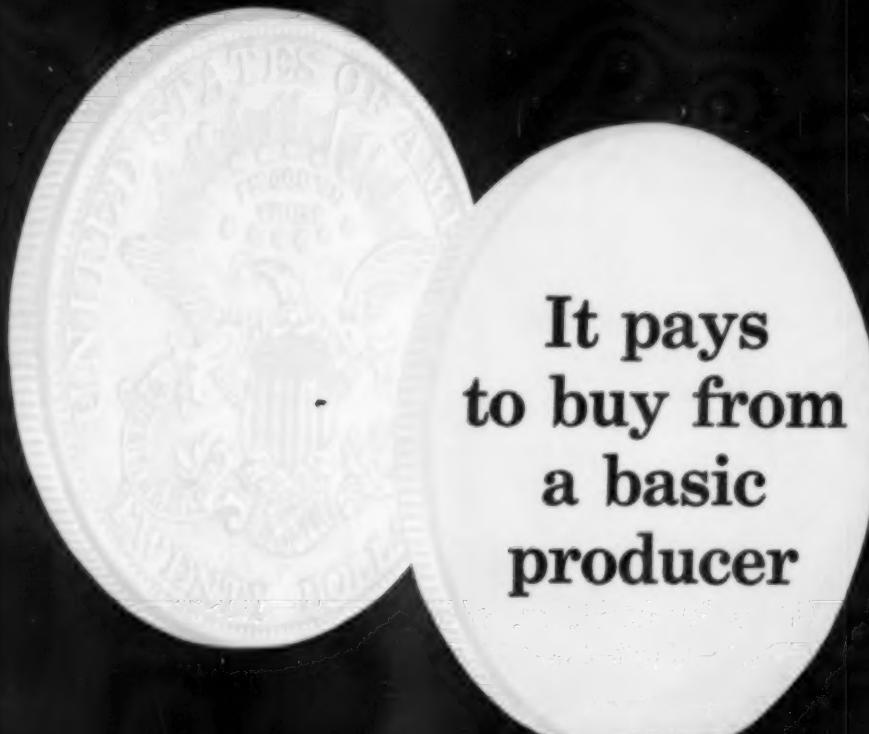
CI can now license the Prayon Process and furnish a complete plant for the production of Phosphoric Acid in any desired capacity. Many years of operating experience combined with superb engineering and development skill have made this process unexcelled in a difficult field. It is the tried and proven process that guarantees producers an economical, trouble-free operation with literally a minimum of maintenance.

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WASHINGTON *Report*

by

Donald G. Lerch

Cornwell, Inc., Washington, D. C.
(Agricultural Chemicals Washington Correspondent)

PESTICIDES are becoming an important tool to demonstrate the County Agent system and the role of agricultural information in several Central and South American countries. As reports from initial test campaigns are analyzed, it seems likely that this trend will continue—and perhaps become larger.

While this means some business to domestic and overseas companies selling in these markets, the use of pesticides to speed the development of modern agriculture in these countries can be looked upon with pride by all men in industry and government research, who contribute to the development of today's wide-range of agricultural chemicals. It was heartening for me to see this development and to witness the enthusiasm among those who reported on events through the third quarter of this year.

Costa Rica is a case in point. An experimental ant control program was launched early this year in the province of San Ramon. The program was under the general leadership of the newly established Costa Rican Extension Service, which was developed through the work of U.S. government technicians in Costa Rica as part of the Point 4 Program now operating under the International Cooperation Administration.

The Costa Rica Extension Service decided to conduct such programs. The next step was to form a central committee in the area made up of the leading citizens in the town, including elected leaders, school teach-

ers, the clergy, doctors, members of the 4-S Clubs (their terminology for what we call 4-H Clubs), parents, and school children. The central committee formulated the basic plan, and then organized several subcommittees with memberships including policemen, entomologists, teachers, general educators, and others. It's interesting to note that there's a law in Costa Rica which forbids property holders to have leafcutting ants on the premises. The policemen are supposed to enforce the law, but of course it's nigh-on to impossible. In this case, policemen were cast in the role of educators rather than law enforcers.

Numerous demonstrations were held, showing how to control leaf-cutting ants, which chemicals to use, and where such pesticide chemicals were available. The chemicals used were applied with a pump. The idea of controlling ants caught on so fast, that all of the pumps in the country were purchased, and it was necessary to import more pumps into Costa Rica. In many cases, groups of five Costa Rican farmers banded together and bought pumps for farm cooperative use.

The Agricultural Information Service of the Costa Rican Ministry of Agriculture supported the campaign by preparing news stories, leaflets, booklets, and general education material.

While the final report is still in process of preparation, the official opinion of the Costa Rican Extension Service thus far is that the

campaign was a success, and that it may well be expanded to other areas of Costa Rica during 1957.

While the volume of business in terms of pounds of material used is significant, it is not exceptional. The important thing is that pesticides are being used to develop teamwork to improve agriculture in Costa Rica. What's more, people are learning about the use of pesticides and about how they can protect their crops.

Several companies in the United States encouraged their dealers in Costa Rica to donate sample experimental materials, and to cooperate with the program in other ways.

Costa Rica has made tremendous progress in the development of an Extension Service and is probably one of the best examples of what can be done south of the border.

Farther south, astride the Equator, lies Ecuador, where more agricultural development progress is being made despite many handicaps, and a population with a much lower rate of literacy than exists in Costa Rica. A fledgeling extension service in Costa Rica is being formed and shows genuine signs of promise.

One of the active parts of the agricultural development program in Ecuador is the 4-S Clubs made up of young farm people. It appears that these clubs will be the nucleus around which a great deal of agricultural information can be imparted, and through which the Extension Service can be most effective.

Here again it appears that pesticides may be an instrument of teaching. The control of leaf cutting ants is also a major problem in Ecuador, and one which lends itself to simple demonstrations with a follow-through that is within the means of many of the nation's farmers. Hence, it appears likely that a country-wide program of ant control through the 4-S Clubs may be launched in 1957. This would provide an opportunity for new County Agents to demonstrate the use of materials, and for young people to follow through and actually control the ants on their farms.

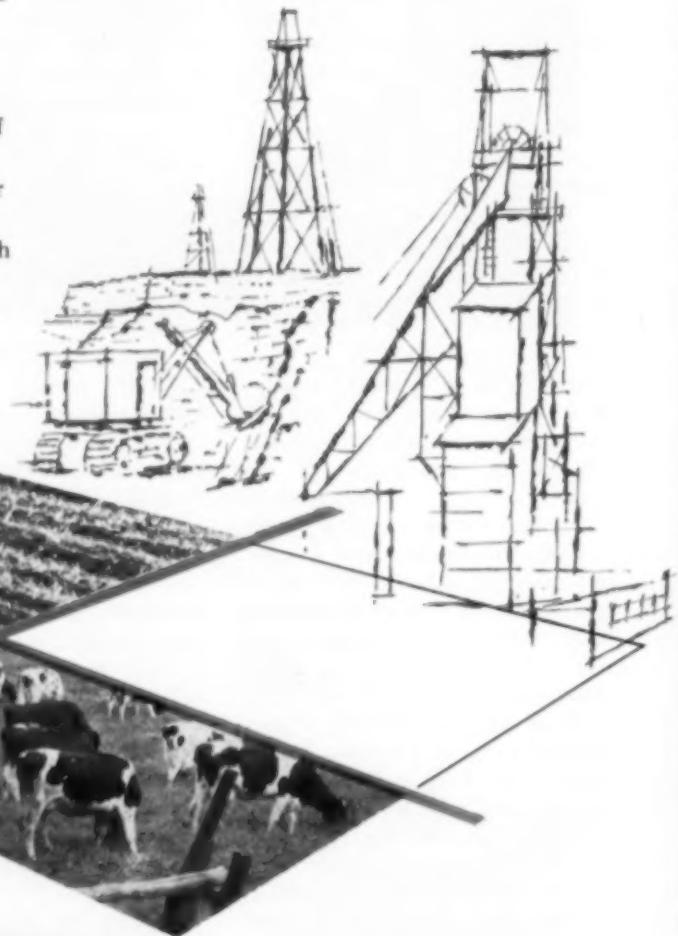
While the control in itself is important, the leaders of the Inter-



a joint venture in Potash

A new, substantial and dependable source of potash for fertilizer manufacturers is being developed by National Potash Company in New Mexico.

National Potash is a joint undertaking of Pittsburgh Consolidation Coal Company and Freeport Sulphur Company. The former is one of the nation's major coal firms, the latter a leading producer of sulphur with additional interests in oil and other minerals. The skills which they bring to the mining, refining and marketing of potash assure top quality, uniformity and service.



**NATIONAL
POTASH COMPANY**
205 EAST 42nd ST. • NEW YORK 17, N.Y.

national Cooperation Administration feel that the greatest benefit is in the demonstration of a practical educational process, both on the part of the teachers and those who learn.

One of the most heartening stories in Ecuador is the tremendous enthusiasm with which farm radio is being accepted by farmers. Until February 1956, no farm information was regularly broadcast on radio! This seems amazing when you consider how much agricultural radio contributes to our own agriculture in the United States, both to the agencies of the government (state and federal) and as an advertising medium for many pesticide companies. Yet it was not until the International Cooperation Program opened the door to the opportunities that such programs were developed.

There are case history stories of farmers who trudged laboriously through miles of jungle to a county agent's office, to find out about a new and improved kind of chick that was being sold on a cost basis to a few farmers. There are stories of families whose entire outlook on life has been changed, because for the first time they realize there are new and better ways to do things than their ancestors did. The impact of agricultural information on the population of Ecuador may be greater than conservative reporting permits. Certainly the thirst for knowledge is great, and in a nation where little more than half the population can read and write, radio seems tailor-made as the force which will speed progress with dramatic impact!

When you meet and talk to the agricultural leaders in Latin American countries you get the feeling that you're in the midst of change which may cause a greater difference in the lives of people south of the border in the next 10 years than has taken place in the past 10 years. Even those North Americans who are prone to discount success and development stories tell me that many Latin American countries are making progress faster in the concept of agricultural extension education and information than we did here in the United States! This opinion is held by some of those

who were among the very first county agents in the U.S.—men who have been through all phases of our agricultural development and who are now reaching the senior years of their lives.

As a result of my latest work in three countries I decided to keep in close touch with progress in Latin American agriculture. More and more companies have the same feeling.

* * * *

The importance of overseas relations is demonstrated in connection with the Mediterranean fruit fly eradication program. In this case, the U.S. is the largest importer of Angelica seed oil, produced for the most part in France and Belgium. This oil is used to attract the Med fruit fly in areas of low infestation. By using Angelica seed oil, it's possible to attract Med fruit flies and perhaps catch the one out of 500 which populates a large area. Without the attractant, the few traps in the vicinity may show no Med flies. Consequently, Washington is concerned about the exhaustion of the Angelican seed oil supply. The price has just about doubled, and the new crop will not be in until July of next year. The plant producing Angelican seed is a biennial, consequently if the U.S. plans any large continuous use of Angelica seed oil, it may be sometime before supplies can be increased enough to reach demand.

Intensive studies are under way to find substitutes, and several promising materials have been found. However, at this writing none is far enough along to be considered as useful enough to fill the gap.

* * * *

Much attention is being directed this month toward the series of cotton insect control meetings. Reviews of the successes and problems of pest control this past season along with projections for next year hold the spotlight. State recommendations of materials are a matter of utmost concern to all pesticide companies selling in the cotton areas.

* * * *

The Food and Drug Administration is considering a petition for a

tolerance of DDT in the fat of cattle, hogs, and sheep which would come from corn which has been treated with DDT for the corn borer. The petition requests also a tolerance for DDT that might be present from the use of backrubbers to prevent corn flies on cattle and also from the use of dips. No specific tolerance is requested for DDT on corn forage, since it's assumed that for the most part corn forage does not move in Inter-State Commerce.

Significantly, no request for a tolerance of DDT in milk is before the Food & Drug Administration at this writing. According to law, the Food & Drug has 90 days in which to make a decision upon this petition, following a certificate of usefulness of DDT from the USDA.

From a farm point of view, the problem would be to keep separate that corn which has been treated with DDT so that it does not find its way into feed for dairy animals.

There seems to be pretty good evidence that this could be done, and that directions for use would be followed to such an extent that milk would be protected.

Nonetheless, this appears to be a crucial decision for the Food and Drug Administration to make. Assuming that the decision is favorable, and that a tolerance is granted, it then becomes a critical matter of whether or not the directions for use on the label of the product are respected to such an extent that there's not an increase in DDT residue showing up in the milk.

*

Kansas PCO's Meet

A technical meeting for termite and pest control operators will be held at Kansas State college, Manhattan, Kan., on December 8. The meeting is being conducted by the Department of Entomology with the cooperation of the Kansas Termite and Pest Control Association.

Discussions will include safe use of sprays and dusts, how to recognize the different kinds of insects, weed control, rodent control, problems associated with ant and roach control, and mosquito control. Meetings will be held in Umberger Hall.

Practical Books For Your Library...

Soils and Soil Fertility

by L. M. Thompson

330 pages, \$5.25 — This authoritative treatment begins by telling what soil is—what makes it up physically, chemically, biologically—and what its moisture-holding characteristics are. The use of commercial fertilizers and farm manure are other subjects under discussion.

Chemistry and Uses of Insecticides

by E. R. de Ong

345 pages, \$7.50 — This book covers all the major insecticidal agents in detail, describing not only their chemical nature and properties, but also their specific action on various types of insects, their methods of application, and their effect on animals and humans.

Phosphates in Agriculture

by Vincent Sauchelli

175 pages, \$3.75 — It deals with the subject of rock phosphate versus superphosphate and colloidal phosphate; with the origin of phosphorus, the mining and processing of the phosphate rock, granulation of superphosphates, fixation of phosphates in the soil, losses of phosphorus and replenishments, phosphorus in nutrition, radioactive phosphorus, basic slag, fused and sintered phosphates and TVA research data on phosphates from field tests in 13 states.

Manual on Fertilizer Manufacture

Second and Enlarged Edition
by Vincent Sauchelli

\$4.75 — Complete volume on superphosphate and mixed fertilizer manufacture for the use of the operating men in the fertilizer works.

The Care and Feeding of Garden Plants

370 pages, \$3.25 — Written by 14 leading specialists in plant nutrition, this profusely illustrated volume tells how to grow more plump, juicy vegetables, a finer lawn, healthier shade and fruit trees, more colorful garden flowers and house plants.

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- Dust Diluents and Carriers—\$4.75
- Handbook of Agricultural Pest Control — \$3.25
- Insect Control by Chemistry — \$15.25
- Chemistry and Action of Insecticides — \$8.25
- Destructive and Useful Insects. Their Habits and Control — \$12.75
- Insect Resistance in Crop Plants—\$9.80
- Weed Control — \$8.25
- Soils and Fertilizers — \$6.25
- Soils and Soil Fertility — \$5.25
- Chemistry and Uses of Insecticides — \$7.00
- Phosphates in Agriculture—\$2.75
- Manual on Fertilizer Manufacture — \$4.75
- The Care and Feeding of Garden Plants — \$3.25

*All prices above are in U.S.A. only — Add 50¢ for Foreign.

Name _____

Address _____

City, Zone & State _____

Handbook of Agricultural Pest Control

by S. F. Bailey and L. M. Smith

190 pages, \$3.25 — A practical handbook for the custom spray operator, the pest control operator, farm advisor, agricultural chemical salesman and field worker. This handbook covers the agricultural chemicals (insecticides, fungicides, herbicides, plant hormones and nutrient sprays, defoliant, etc.), their rates of application, useful formulas, as well as chapters on fumigation, spray machines, toxicology, dusts and dusting, aircraft, and mosquito control.

Handbook of Insecticide Dust Diluents & Carriers

by D. E. Weidhaas and J. L. Brann, Jr.

Commercial information and data based on research conducted at Cornell University and that supplied by basic manufacturers of the insecticide dust diluents and carriers.

Insect Control by Chemicals

by A. W. A. Brown

817 pages, \$15.25 — This text classifies the insecticides and gives their chemical, physical properties; discusses the hazards to avoid in formulation, mixing and use of compounds; and illustrates modern application equipment.

The Chemistry and Action of Insecticides

by H. E. Shepard

594 pages, \$8.25 — This new book gives a vast wealth of information on insecticides—their chemical, physical, and toxicological aspects. Covers these chemical groups: Arsenical Compounds; Fluorine Compounds, Sulphur Compounds; Copper Compounds; Inorganic Substances; Nicotine; Rotenone; Petroleum, Soaps, Cresocotes; Synthetic Organic Insecticides.

Destructive and Useful Insects Their Habits and Control

by C. L. Metcalf and W. P. Flint

1071 pages, \$12.75 — This authoritative guidebook covers hundreds of both useful and destructive insects—treating the inner and outer structure and form of general species. Here are descriptions of more than 500 types of insect pests of the U. S. and Southern Canada.

Insect Resistance in Crop Plants

by Dr. Reginald H. Painter

520 pages, \$9.50 — Here is a complete analysis of the relationship between crops and phytophagous insects together with a full analysis of the insect resistant varieties of important crops, such as wheat, corn, cotton, sorghums, potato.

Weed Control

by W. W. Robbins, A. C. Crafts, and
R. N. Rayner

543 pages, \$8.25 — Here is an authoritative, thorough book. Based on experience, research and experiment, it shows what methods of weed control have proved most effective for weeds of all species—shows how and when to apply a control measure, the season and rate of application, dosage, etc., and outlines the materials and machinery needed.

Soils and Fertilizers

by F. E. Bear

375 pages, \$6.25 — This text presents the basic scientific facts and principles behind the production and utilization of agricultural chemicals.

INDUSTRY News

Potash Co. Appoints Smith



The Potash Co. of America, Carlsbad, N. M., have appointed F. Edward Smith, Jr. assistant to the vice-president in charge of sales. He joined the company in 1938 and has been handling sales in the Northeastern and Canadian territory. Before coming to Potash Co., Mr. Smith was with the Reed Phosphate Division of the Davison Chemical Co. at Charleston, S. C. In his new position he will be located at the company's offices in Washington, D. C.

Miller Acquires Plant

Miller Chemical and Fertilizer Corp., Baltimore, manufacturer of agricultural fertilizers and pesticides, recently acquired the Lancaster Bone Fertilizer Co. plant at Ephrata, Pa. The acquisition gives Miller an additional manufacturing and distributing point for dry and liquid fertilizers, insecticides, fungicides, and weed-killers in Eastern Pennsylvania. Miller will maintain a sales office at the Ephrata plant and plans to enlarge the existing facilities.

Shell Announces Expansion

Shell Development Co., New York, announced recently plans for a million dollar expansion program for its Modesto, Calif., agricultural research center. Six major new laboratories and office buildings will be added to the present group. Shell will transfer more than fifty families into the Modesto area from Denver and other Shell laboratory locations. A total staff of more than 100 people will be employed. Construction is scheduled for completion in the fall of 1957.

Biological research in the expanded facility will be under the direction of Dr. Roy Hansberry, present

Modesto laboratory manager. A chemical research group will be under Dr. K. E. Marple, presently manager of Shell's Denver laboratory.

S. H. McAllister, director of Shell Development's agricultural research division, will administer the two groups, together with a smaller one for products application research under Dr. E. F. Feichtmeir.

Anaconda To Buy Ammonia

The Anaconda Co., Anaconda, Mont., has announced the signing of a contract with the U. S. Steel Corp. to purchase anhydrous ammonia from U. S. Steel's new installation near Provo, Utah. The ammonia will be used by the fertilizer department of Anaconda for the production of ammonium phosphate fertilizer at the firm's Montana plant, which will go through a million-dollar expansion.

NATA Elects Bertram

Galen Bertram of Greensberg, Kans., was elected 1957 president of the National Aviation Trades Assn. last month at the 17th annual convention of the NATA held in St. Louis.

The Aerial Applicators Conference of the convention saw John Neace of Marsh Aviation, Phoenix, Ariz., reelected as vice-president for agricultural activities to head the National Aerial Applicator committee of the NATA.

A seven-man agricultural committee was also elected from each of the former CAA seven regions as follows: 1—M. C. Young (N.J.), 2—Cy Emery (Miss.), 3—Charles Wells (Ill.), 4—Ken Medders (Tex.), 5—Sam Goldin (Mo.), 6—Gene Heckathorn (Cal.), and 7—Jack Hughes (Mont.).

Escambia Appoints Reed

The Escambia Chemical Corp., New York, has appointed Robert G. Reed business manager of the company's research division. Mr. Reed will be responsible for the business functions and the non-technical administration of Escambia's research department.

Mr. Reed is a resident of Auburndale, Mass.

Nutrients Up In N. C. State

Speaking before the annual Ohio Regional Lime and Fertilizer Conference, November 19-20, W. H. Garman, chief agronomist of the National Plant Food Institute reported on preliminary estimates made by the USDA indicating increased consumption in the east north central states of primary nutrients in 1955-56. Increases were reported at 15% for nitrogen, 2% for P_2O_5 and 5% for K_2O .

Total tonnage of all fertilizers sold in the east north central states in 1955-56 was 4,336,414, representing an increase of 5% over the previous year. The consumption of mixtures decreased by 2.5%, while the consumption of materials increased by 11%.

Moore Joins W. R. Grace

Richard L. Moore, formerly with Foster D. Snell, Inc. has joined the public relations division of W. R. Grace and Co., New York. Mr. Moore will be responsible for the public relations of two of Grace's seven chemical divisions—Grace Chemical Company Division, Memphis, and the Polymer Division, which has headquarters at Clifton, N. J.

Diamond Appoints Snyder



The Diamond Black Leaf Co., Cleveland, has appointed Darl E. Snyder to the position of eastern district manager. Mr. Snyder will supervise the merchandising and sale of Black Leaf agricultural chemicals in a 14-state area from Maine to North Carolina. He will make his headquarters at the company's eastern sales office in Lancaster, Pa.

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DIAZINON

FORMULATIONS

GEIGY DIAZINON is one of the most effective and economical residual fly control chemicals available. Because of its long residual action, only 2 or 3 residual sprays are required to control flies in dairy barns for an entire season. Also recommended for post-harvest treatment of strawberry plants and cherry and pear trees, for control of aphids, mites and cherry fruit flies.



SEQUESTRENE

IRON METAL CHELATES



SEQUESTRENE iron chelates are the original metal chelates in the field of agriculture. They are designed for the correction of iron deficiency (chlorosis) in ornamentals, fruit trees, vegetables and turf. SEQUESTRENE chelates may be applied as soil applications or foliage sprays. Completely water soluble and compatible with fertilizers and most commonly used pesticides, SEQUESTRENE iron chelates are available for use on both acid and alkaline soils.

CHLOROBENZILATE

FORMULATIONS

GEIGY CHLOROBENZILATE is a safe, effective miticide for control of various species of mites on apples, pears, azaleas, holly, spruce, and other ornamental and agricultural crops. In addition to being safe to humans, it is relatively non-toxic to bees in field applications. It has long residual action and is compatible with most commonly used insecticides and fungicides.



METHOXYCHLOR

FORMULATIONS



GEIGY METHOXYCHLOR is the "general purpose" insecticide for control of plum curculio, grape berry moth, cucumber beetle, leafhoppers, and many other insects attacking fruit, vegetables and forage crops. Residual sprays applied to empty grain bins are effective in controlling many insect pests of stored grain. Direct applications to livestock are effective in controlling horn flies, lice and ticks.

Stauffer Shifts Exec. Posts

Stauffer Chemical Co., New York, last month announced that George C. Ellis was appointed a senior vice-president and general manager of the West End Chemical Co. Division. He was also elected to Stauffer's Board of Directors.

At the same time it was announced that H. D. Hellmers, formerly vice-president in charge of production for West End Chemical, has been named division vice-president, production, of Stauffer; and that D. G. Ellis, West End sales manager, has been appointed division vice-president, sales, of Stauffer.

Mr. Ellis was one of the original organizers of West End Chemical and was an officer and a director of that company for the past 26 years. He served as West End's president from 1943 until the company was merged into Stauffer on Oct. 1.

Canadian Firm to Construct

Explorers Alliance Ltd., Toronto, recently announced that it is interested in building a \$33 million industrial plant in Mexico for the production of pure zinc and farm fertilizer. Negotiations are being carried out with the Mexican government, and Mexican capital is expected to be employed for the project. The announcement said that ore would be derived from existing mining concerns in Mexico and plans are being completed for a smelter with a capacity of 135 metric tons of pure zinc, 220 tons of sulphuric acid, and 240 tons of fertilizer per day.

V-C Sales, Earnings Up

The Virginia-Carolina Chemical Corp., Richmond, announced recently that the unaudited net income for the quarter ending Sept. 30 was \$212,774, a rise over last year's first fiscal quarter of \$117,513. Net sales for the first three months amounted to \$10,123,085 compared with \$9,667,009 for the same period last year. In making the announcement, William C. Franklin, V-C board chairman, said that "first quarter operating results are a very small proportion of the total results for the

entire fiscal year, primarily because of the seasonal nature of our fertilizer sales and distribution. For this reason," he said, "first and second quarter earnings cannot be indicative of anticipated earnings for the entire year."

At the same time, Mr. Franklin announced the election of Justin Potter, of Nashville, Tenn., as the company's eleventh director. Mr. Potter is chairman of the board of Cherokee Insurance Co. and a director of the Commerce Union Bank of Nashville.

Nelson Honored by Rutgers



Dr. Franklin C. Nelson, senior technologist for Esso Standard Oil Co., was recently honored by Rutgers University, New Brunswick, for ten years of service as chairman of the advisory council of the Thomas J. Headlee Fellowship in Entomology. The fellowship was organized in 1945, to carry on fundamental research shortly after the death of Dr. Headlee, former chairman of the Entomology Dept. of Rutgers.

Pictured above, Dr. Nelson, (at left) is being presented with a framed letter from Rutgers president, Dr. Lewis Webster Jones, expressing the gratitude of the University for his outstanding service. Dr. William H. Martin, dean and director of the College of Agriculture and the Experiment Station, is pictured making the presentation at the recent meeting.

Present officers of the council are Dr. H. L. Haynes, Union Carbide and Carbon Corp., chairman; Dr. C. C. Alexander, Geigy Company, Inc., vice-chairman; Harold Rife, Boyle-Midway, Inc., chairman of the finance committee, and Van Wie Ingham, Rutgers, secretary.

Emulsol Appoints Raven

Arthur O. Raven has been appointed sales manager of the Emulsol Chemical Corp., Chicago, a division of Witco Chemical Co. Formerly assistant sales manager, he joined Emulsol in 1953 as sales office manager and assistant to the executive vice-president. Prior to that he had been a technical sales representative for Abbott Laboratories.

Predict '57 Cotton Crop Cut

Farmers of the Southeast are expected to put roughly 40% of their allotted acres in the soil bank, in 1957. The soil bank plan, which was adopted too late to have any marked effect this year, is expected to result in a much smaller crop next year.

The cotton acreage going into the soil bank is expected to be increased substantially in small farms with an allotment of ten acres or less, which are permitted, under existing legislation, to place their entire allotment in the bank.

One observer comments, "The chances are that a large percentage of the small farmers who put their full allotment in the soil bank never will farm again. Those who have tried to make a living on such a small acreage in the last few years have found the going tough and are anxious to quit farming."

Ala. Pest Control Groups

Members of the program committee met at Auburn, Ala. last month to make final plans for the first annual meeting of the Alabama Association for Control of Economic Pests, which will be held in conjunction with the tenth Alabama Pest Control Conference, at the Alabama Polytechnic Institute Agricultural Experiment Station at Auburn Feb. 19-20. Programs on the control of plant diseases, weeds, insects, rodents, and nematodes will be presented during the conference.

Soil Builders in Merger

Soil Builders International Corp., Clarksville, Tenn., has acquired the name and assets of Aluminum & Chemical Corp., Newport, Ark., manufacturers of aluminum rolling mill products, for an undisclosed sum, it was announced recently. President of Aluminum & Chemical, Victor Muscat, was appointed president and board chairman of the merged company, which will continue under the Soil Builder's name.

Soil Builders International manufactures soil chemical products for home and garden consumption, chief

of which is "Glorion," a soil conditioner, and "Sun-R-Guard," a popular crabgrass killer. Other officers of the new company are Julius Block, vice-president, and Joseph Conley, secretary.

U.S. Potash Appoints Three



L. R. Boynton



R. H. Walton

The United States Potash Co., New York, recently announced a number of staff changes, headed by the appointment of L. Ralph Boynton as assistant sales manager. Mr. Boynton was Southern sales manager and had been associated with the firm's Atlanta office since 1939.

Succeeding him as manager of the Atlanta office is Robert H. Walton, who has been in the Atlanta office since 1950. Joe F. Stough joined U. S. Potash as sales representative in the Midwest territory formerly served by Col. Charles E. Littlejohn, who is on a leave of absence due to health. Mr. Stough was district manager for the Davison Chemical Co. at Charleston, S. C.

Union Special Names Two

The Union Special Machine Co., Chicago, last month moved Jack H. Muir to the company's St. Louis office as assistant manager, and Hugh L. Gratsch to the company's Development Division at Chicago. Mr. Muir had been assistant manager in Cincinnati, and will take over Mr. Gratsch's position in St. Louis.

To Build Nitric Acid Unit

Construction of a nitric acid concentrator has begun at the El Dorado plant of the Lion Oil Co., El Dorado, Ark., a division of Monsanto Chemical Co. The unit will concentrate 98% nitric acid now being manufactured at two existing units.

The concentrator is expected to produce in normal operation, 40 tons per day of nitric acid of 95% strength, which will be used primarily as a raw material by another Monsanto plant. Included in the construction will be blending facilities for production of 68% acid.

The new unit will be housed in a steel framework equivalent in height to a four-story building. Construction contractor and designer is Chemical and Industrial Construction Co., a subsidiary of Chemical and Industrial Corp., Cincinnati, Ohio. Completion is scheduled for March 1957.

Stauffer to Build in Ariz.

The Stauffer Chemical Co., New York last month announced plans to construct a new plant in Phoenix to serve the rapidly developing farm areas in Arizona. Heretofore, Stauffer has supplied the Arizona market from its Los Angeles plant.

Diamond Announces Mexican Expansion

The Diamond Alkali Co., Cleveland, last month announced the formation of a new company to produce liquid and dust insecticides, the opening of a new sales office for another producer of agricultural chemicals, and expansion of an existing firm's plant as part of a general expansion of the company's activities and interests in Mexico.

The new producer of insecticides is Insecticidas y Fertilizantes Diamond del Norte S.A. at H. Matamoros, Tamps, which will have access to the engineering, research, and technical facilities of Diamond Alkali. Principal stockholder is Antonio L. Rodriguez, of Monterrey, Mexican banker and industrialist, and general manager is Ing. Luis Briones Moreno, previously general manager of Insecticidas Fertilizantes S.A.

Another Mexican venture recently formed with Diamond's technical assistance is Diamond Black Leaf de Mexico S.A. de C.V., which recently opened a sales office in Mexico City. The company, known in Mexican commercial circles as "Diablame," last month announced two executive appointments. Bruce D.

DDT Resistance Studied

The advisory council of the Thomas J. Headlee Fellowship in Entomology at Rutgers University recently heard a report on studies of an enzyme which reduces DDT to a relatively non-toxic product. Called DDT-dehydrochlorinase, the enzyme is reportedly found in high concentrations in DDT-resistant flies, and also appears in the Mexican bean beetle and other insects particularly difficult to control.

Two of the Headlee researchers, Fred C. Swift and Thomas M. Stevens, described studies to determine which organs of the insects are responsible for production of the enzyme, and further studies of the chemical properties of the spreading agent, hydronidase. Mr. Stevens said it has been determined that the enzyme is located in the salivary glands, and he suspects that it plays a role in digestion and assimilation.

Knoblock, formerly manager of the parts and accessories division of General Motors de Mexico S.A., was



Bruce D.
Knoblock

named general manager. Jack L. Schack, who had been manager of the chemical department of Bunge-Mexico, S.A., and for two years with the Diamond sales staff, was appointed sales manager. "Diablame" operates an insecticide-manufacturing plant, staffed by more than 75 Mexican employees, in the Xalostoc industrial zone of Mexico City.

Diamond is also furnishing assistance to Insecticidas del Pacifico S.A. de C.V., which recently built an insecticide-formulating plant in Cd. Obregon, Sonora. The facility is presently blending dust for cotton and other crops on the Pacific Coast of Mexico, and additional equipment is being installed for the manufacture of liquid insecticides and concentrates.



Arcadian® News

Volume 1

For Manufacturers of Mixed Fertilizers

Number 2

RADICAL PROPOSALS IN MODEL FERTILIZER LAW

Undesirable to Fertilizer Men and Farmers

At the October 21st meeting of the Association of American Fertilizer Control Officials, a resolution was passed putting the Association on record as favoring the change in fertilizer laws in each state of the U. S. to adopt officially the model uniform law worked out by the Association. This model law, if adopted, would bring about a change in fertilizer guarantees of P_2O_5 to P and K_2O to K. It also includes the optional provision for a requirement of "guarantee of the sources from which the nitrogen, phosphorus and potassium are derived."

We believe that every manufacturer of superphosphate and triple superphosphate should oppose this plan to change the fertilizer guarantees of P_2O_5 to P because of the effects such change will have upon the manufacturers of fertilizer materials, upon the manufacturers of mixed fertilizers, and upon the cost and quality of fertilizers offered to the farmer. We believe the industry should oppose this because of the confusion that will result in the fertilizer industry and among farmers in the years required for the transition. Also, we believe industry should be opposed to the scrapping of all the bulletins at our experiment stations, all the technical articles and all the text books that are written in terms of P_2O_5 and which represent the compilation of data from many years of agricultural research and millions of dollars of state and government appropriations expended in their development.

Special Interests Support Proposal

There are certain interests who expect to gain substantial competitive advantages for products such as di-ammonium phosphate, calcium metaphosphate and phosphoric acid. We understand these interests are putting forth very strong efforts to bring about the change in the guarantee of P_2O_5 to P and that, furthermore, they are working actively to lay the groundwork for injecting into the proposed model bill when it is presented to the separate state legislatures, amendments requiring that minimum water soluble phosphorus be guaranteed.

The reasons for the proposed changes, as given by the A.A.F.C.O., is their desire to simplify the terminology used by agricultural writers in reporting results from experiments involving different forms and amounts of plant foods. If this simplification were the sole objective of those advocating these changes, it would appear easier and less disturbing to industry and to agriculture if the agricultural writers were asked to adopt a code of word usage that would eliminate irregularities in their terminology.

To change the fertilizer laws of 46 states is a tremendous undertaking that will involve the time of many people and much expense that might well be applied to useful legislation. In most states the attempted changes are expected to result in severe legislative battles and it is anticipated there will be many defeats as well as many amendments. This would result in less uniformity than presently exists.

Lower Quality—Higher Cost

Those who are unfamiliar with the technical features of the manufacture of mixed fertilizers may fail to appreciate how a change in the guarantee terminology could greatly alter the competitive relationships of fertilizer materials, substantially modify the composition of mixed fertilizers, reduce their quality, and increase their cost to the farmer. But these would be the real consequences of the proposed change from P_2O_5 to P. Let us present two illustrations of a change that may result.

A popular 10-10-10 fertilizer is presently made somewhat as follows:

	% N	% P_2O_5	% K_2O
1030 lbs. 20% P_2O_5 , Superphosphate	0	10	0
250 lbs. 41% N. Nitrogen Solution	5	0	0
90 lbs. 45% N. Urea	2	0	0
300 lbs. 20.5% N. Sul. of Ammonia	3	0	0
330 lbs. 62% K_2O Muriate of Potash	0	0	10
2000 lbs. Total Analysis	10	10	10

When the farmer buys this product, he obtains free about 620 lbs. of calcium sulphate and about 78 lbs. additional sulphur from the ammonium sulphate. Both the soluble calcium and the soluble sulphate are essential plant foods which would need to be purchased by farmers in the humid areas of the U. S. if they were not furnished free in superphosphate.

By contrast, note approximately how a 14-14-14 would

be made under the proposed N-P-K plan:

	% N	% P	% K
1400 lbs. 20% N-53% P ₂ O ₅ Di-Am. Phos.	14	14	0
545 lbs. 62% K ₂ O Muriate of Potash	0	0	14
55 lbs. conditioner or sand	0	0	0
2000 lbs. Total Analysis	14	14	14

This product would contain no calcium and no sulphur and the N-P-K would each be 100% water soluble. In composition it would be similar to the German Nitrophoska fertilizers which were imported into the Atlantic Coast states in the 1930's and which gave most disappointing results in terms of crop yields.

To a farmer accustomed to a 10-10-10 or a 12-12-12 (on the N-P₂O₅-K₂O basis) a 14-14-14 on the N-P-K basis may not look off balance. It is, however, a 14-33-17 on the oxide basis and a great deviation from the old 1-1-1 ratio.

Most Expensive Form of Phosphorus

Since phosphoric acid, from which ammonium phosphates are made, is by far the highest cost form of P used for fertilizers, averaging nearly twice the cost of P in normal superphosphate, there can be no actual saving to the farmer, to compensate for the loss in gypsum and other nutrients, even when a large saving in freight from a long haul, the lower cost which obtains from fewer bags, and the saving in labor from less bulk handling, are balanced against the higher first cost of the P. Since there is approximately 137 pounds of gypsum in ordinary superphosphate per unit (20 lbs.) of P₂O₅ in a ton of 14-14-14 (N-P-K) the farmer's loss would be about 1920 lbs. of gypsum.

Would "Junk" Superphosphate

For comparison of costs, we refer to the article by T. P. Mignett, G. C. Hicks, and J. E. Jordan, "Use of Di-ammonium Phosphate in Production of Granular, High-Analysis Fertilizers", Commercial Fertilizer and Plant Food Industry, PP. 24-25, October, 1956—

"Following are the costs at a typical midwestern location of the amounts of concentrated superphosphate and nitrogen solution that are equivalent to 1 ton of di-ammonium phosphate:

21 units N 0.517 tons N. Sol. (40.6% N)	x \$57/ton = \$29.47
53.7 units P ₂ O ₅ 1.167 tons CSP (46% P ₂ O ₅)	x 60/ton = 70.02

or a total cost of \$99.49

"The delivered price of di-ammonium phosphate may be somewhat less than \$99.49 per ton in some locations, but it will probably be more than \$99.49 in most locations."

Had these authors used 20% P₂O₅ superphosphate in the comparison, the plant food cost equivalent would have been:

21 units N 0.517 tons N. Sol. (40.6% N)	x \$57.00/ton = \$29.47
53.7 units P ₂ O ₅ 2.685 tons Superphos. (20% P ₂ O ₅)	x 17.60/ton = 47.26

or a total cost of \$76.73

This would represent a difference of \$22.76 in favor of ammoniated superphosphate. In addition to lower cost, the farmer would obtain without cost, other than transportation and handling, about 1.6 tons of gypsum (CaSO₄ 2H₂O).

The above are some of the obvious reasons for opposing the change. However, there is a more serious danger to the superphosphate industry, and to farmers, in the plan of those who hope to amend the proposed model fertilizer bill by requiring a guarantee of "soluble P" instead of "available P".

Don't Need Soluble P Guarantee

We understand that it is the plan of the group favoring water soluble P guarantee, not to discuss this feature openly until the proper time to introduce the amendment. It seems to be their hope that the change in terminology will slide through the legislature unnoticed.

Presumably it is the further hope of this particular group desiring water soluble P guarantee, that if the first legislatures acting on the so-called model bill do accept the "soluble Phosphorus" amendment, other state legislatures may be more easily induced to approve similar amendments in the interest of uniformity.

It should be realized of course that once the proposed fertilizer bill is introduced into a state legislative body, it is subject to change by the amendments of the various interests who have the political strength to make their wishes stick. Many good legal proposals open up legislative considerations that result in monstrosities not anticipated by the original well-intentioned proponents.

Misleading to Farmer

We are sure that every manufacturer of 20% P₂O₅ superphosphate is aware of the undesirable features of a required, or even a permitted, guarantee of minimum water soluble phosphorus. It would immediately lead the uninformed farmer to believe water solubility to be a desirable property of fertilizer phosphorus. This in turn would induce competing fertilizer salesmen to "sell" phosphorus "solubility" just as they used to "sell" "organic" nitrogen. The natural consequence would be that all fertilizer manufacturers would feel forced to use more water soluble phosphorus than otherwise considered desirable.

There is only one completely water soluble phosphorus fertilizer material that presently can be used in substantial amounts in non-granulated fertilizer mixtures, without destroying desirable physical properties of the mixture. That material is ammonium phosphate (mono- or di-) and, as stated above, it is the most costly of fertilizer phosphorus. It is also considered the least desirable form for the humid soils of the eastern half of the U. S.

Mono-calcium phosphate of superphosphate, an excellent material, is water soluble but it is too hygroscopic and too reactive for satisfactory use in undried mixtures containing the usual nitrogen fertilizer salts and muriate of potash. Also, mixtures of muriate of potash and mono-calcium phosphate destroy fertilizer bags. Consequently, the mono-calcium phosphate of superphosphate must be "neutralized" or changed to the more stable di-calcium phosphate by means of ammoniating media or by other alkaline materials such as lime. This change eliminates water solubility but not desirable availability to crops.

Would Increase Farmers' Cost of N

The fertilizer industry currently uses more than 600,000 tons of nitrogen as ammoniating liquids in "neutralizing" superphosphates, and these liquid forms furnish the lowest cost nitrogen available to the fertilizer industry and consequently to the farmer. In common solid carriers, nitrogen costs from 50 to 100 per cent more than in these low cost ammoniating solutions.

Thus, a legal requirement for a guarantee of water solubility of fertilizer phosphorus would eliminate the full use of ammoniating solutions and raise the farmers' fertilizer costs possibly by \$50 million or more per year, including the cost for other needed conditioners when ammoniation is not practiced. Obviously, neither the fertilizer manufacturer nor the farmer will submit to this unwise and costly legal change after the above facts are known.

Need Gypsum from "Super"

As the agronomists and soils specialists of the Carolinas, Georgia, and Florida learned from tests with German Nitrophoska in the 1930's, ammonium phosphate fertilizers do not give good results in the humid soils of the eastern U. S. unless gypsum is added in generous amounts to furnish the calcium and sulphate ions required to give plants balanced nutrition. Gypsum has many desirable functions in humid soils. In addition to supplying available calcium and sulphate ions needed for growth, gypsum is an excellent soil conditioner which is more practical than synthetic conditioners.

Also, when soils are water logged, as often occurs in humid areas, gypsum furnishes oxygen to bacteria growing under anaerobic conditions. However, as bacteria use the oxygen, the sulphur is released to the atmosphere as hydrogen sulphide. This is a means of substantial losses of sulphur and is a reason why annual renewal of calcium sulphate to the soil is desirable.

from NITROGEN DIVISION *Allied Chemical & Dye Corporation*

Consider the major forms of fertilizer phosphorus that will be affected by the proposed law:

a. 20% P_2O_5 superphosphate would be guaranteed as an 8.75% P. This is the lowest cost form of phosphorus. It contains about 60 per cent of gypsum.

This product will be greatly discriminated against by the proposed law, especially so if a guarantee of water soluble is required.

b. 48% P_2O_5 triple superphosphate would be guaranteed as 21% P. This product contains no sulphur.

This product will not be hurt as badly as 20% superphosphate, but will suffer a setback compared to di-ammonium phosphate.

c. 20% N-53% P_2O_5 di-ammonium phosphate would be guaranteed as 20% N-23% P. This product contains no calcium and no sulphur. It is highest in cost of the phosphorus compounds because it is made from phosphoric acid, another costly form. It is entirely soluble.

The proposed change in the law would add tremendously to this product's competitive strength.

d. 64% P_2O_5 calcium meta-phosphate would be guaranteed to contain 28% P. It contains no sulphur and its agronomic worth is still to be proven under varying soil conditions.

This product will be helped by the change from P_2O_5 to P , but not by the water solubility requirement except when treated with sulphuric acid (an additional costly step) in making it suitable for mixed fertilizer use.

Comparison of these materials illustrates how the proposed change in guarantees will make a malproportioned product like di-ammonium phosphate appear to have the balance of a ballet dancer while normal superphosphate will appear to the farmer as low-grade refuse.

Favor Form Mixing

It should be pointed out further that a big danger from di-ammonium phosphate, to the fertilizer manufacturer, lies in the probability that if ammonia producers shift from production of sulphate of ammonia to production of di-ammonium phosphate, a great proportion of the tonnage would need to be sold direct to farmers, who will combine this with potash to make home-mixed fertilizers.

The potential production of di-ammonium phosphate in the U. S. is very large, and this product, sold either for fertilizer manufacture or for direct use to the soil, may be expected to replace an equivalent tonnage of phosphate as ordinary superphosphate. This in turn would reduce a very large proportion of the lowest cost solution nitrogen now used to ammoniate superphosphate. Every fertilizer manufacturer should study carefully the impact these changes will have upon the profitability of his mixed fertilizer business over the next decade.



700,000 Farm Ponds are a Huge Market for Fertilizers

Every farm pond in your area is a market for mixed fertilizer. These artificial ponds, usually built with the advice of the Soil Conservation Service or the Extension Service, now number over 700,000 in the nation. The needs for water for live-stock, soil and water conservation, fire-fighting and irrigation continue to make them popular.

With our expanding population, good natural fishing gets scarcer and more crowded each year. More and more farmers prefer the sport of fishing their own stocked ponds, as recreation for themselves and their families and friends. Fertilizer produces 200 to 500 pounds of fish in ponds of $\frac{1}{2}$ -acre to an acre or more in size. Ponds smaller than $\frac{1}{4}$ -acre seldom provide good fishing.

Fish Size Up Faster

Fertilizer booms fishing by providing the essential mineral foods for tiny water plants called plankton. In turn this provides food for insects, small animals and small fish which are food for larger fish. Many states supply fish for stocking such ponds. The most common combination is bluegill bream and bass. Unfertilized ponds seldom provide more than 15 to 40 pounds of fish per year per acre of water surface.

To provide food for the fish, farm pond owners start in early spring by spreading 100 pounds of 2-2-1 or 1-1-1 ratio fertilizer per acre of water surface. Every few weeks another 100 pounds of fertilizer is added—enough to keep the water brownish or greenish in color from

the growth of plankton. A common rule is to add fertilizer when you can see your hand clearly as you dip an arm to elbow-depth in the water.

Commercial fertilizer does the best job, according to the experts. Organic fertilizers tend to encourage large algae and other undesirable plant growth. The tiny plants favored by commercial fertilizer not only feed the fish, but also shade out many undesirable pond weeds.

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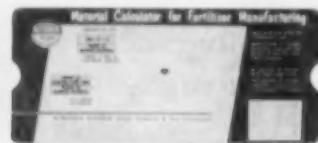
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From the left are: Dr. F. W. Poos, retiring chairman of the Eastern Branch; C. C. Alexander, newly-elected chairman; Dr. Bailey B. Pepper, Eastern Branch Representative to the governing board of the ESA; and Dr. B. F. Driggers, Secretary-Treasurer of the Eastern Branch.

Symposium On Mites Featured At Meeting Of ESA's Eastern Branch

MORE than 200 entomologists at the 28th annual meeting of the Eastern Branch of the Entomological Society of America last month heard a special symposium on current mite problems, which pointed out the increasing need for all types of knowledge about mites. The meeting was held Nov. 19-20 at the Haddon Hall Hotel, Atlantic City, N. J.

Moderated by Dr. Paul J. Chapman of the New York Agricultural Experiment Station, Geneva, N. Y., the symposium brought together some of the outstanding authorities on acarology in North America.

Dr. Philip Garman, Connecticut Agricultural Experiment Station, New Haven, speaking on the control of plant mites, reported that control in orchards, greenhouses and on ornamentals is a little easier than it had been, but cautioned that continued efforts to control mites over long periods with chemicals are "frustrating" to the entomologist. Dr. Garman expressed the hope that younger entomologists will not "put all their eggs in one basket, but will continue to investigate different approaches to the problem." He recommended studies of methods for maintaining production without excessive nitrate application, use of chemicals that avoid destruction of natural enemies, and a careful study of plants or varieties that are able to resist mite attacks.

Dr. D. A. Chant of the Canadian Entomological Laboratory, Belleville, Ontario, reported on cur-

rent studies of predators of plant-feeding mites. He stated a belief that biological control can play a great part in orchard economy as "indeed it does today in Nova Scotia and (to some extent) in England." He pointed out, however, that only by placing the matter of biological control on a "sound scientific basis can we hope for this method of control generally to be accepted."

Dr. Philip J. Spear presented a paper by Ralph E. Heal of the National Pest Control Assn., New York, describing various experiences with mites in the pest control industry.

"Chemical Control of Spider Mites and the Genetics of Resistance," was the title of a report by Dr. Floyd F. Smith, Entomology Research Branch, USDA, Beltsville. He declared that his findings indicated that resistance in mites to chemicals is inherited, and does not come about through long exposure to sub-lethal doses of insecticides. Dealing with various resistant colonies of spider mites reported in recent years, Dr. Smith's study showed however, that not all populations of insects contain individuals with inheritable genes for resistance.

Dr. George W. Wharton of the University of Maryland presenting an outlook and summary in his review of the current mite problem, reported that the outlook for the early solution of the current mite problem is remote. The outlook for the development of the field of acarology is "bright, in-

deed," he declared.

"To the established investigator or to the student," Dr. Wharton said, "acarology offers opportunity for every type of biological investigation. For those interested in pioneering work, acarology offers untouched openings in every discipline."

He summarized the reports of the symposium by saying that "practical problems have been recognized that require for their solutions knowledge of all kinds about mites. In response to this state of affairs, an exciting new specialty, acarology, has been developed."

Also participating in the special symposium were: Dr. Henry S. Fuller, Walter Reed Army Medical Center, Washington, D. C., who reported on the progress in medical and veterinary acarology; and Dr. Edward W. Baker, Entomology Research Branch, USDA, Washington, whose subject was the "Problems in Identification of Mites."

THE convention was presided over by Dr. F. W. Poos, 1956 Chairman of the Eastern Branch. C. C. Alexander of Watertown, N. Y., was elected Chairman of the branch for 1957 to succeed Dr. Poos. Dr. Neely Turner of the Connecticut Agricultural Experiment Station in New Haven was elected Vice-Chairman and Dr. B. F. Driggers of New Brunswick, N. J., was re-elected Secretary-Treasurer of the branch.

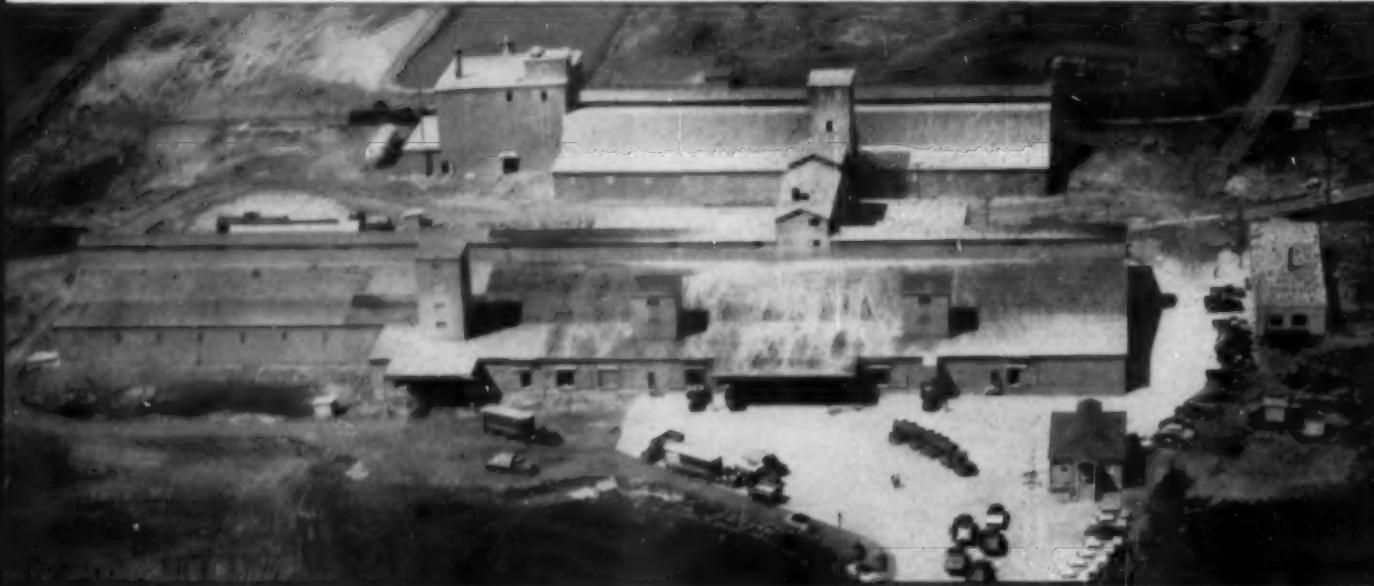
The delegates selected New York as their 1957 convention site and will meet Nov. 26 and 27 at the Hotel Commodore in that city.

The opening session of this year's meeting was highlighted by an informal panel discussion on the "Current Physiological Investigations Related to the Practical Work of Economic Entomologists."

John J. Pratt, Quartermaster Re-
(Continued on Page 104)

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Miss. Insect Conf. Jan. 10-11

Insect resistance and dangers of phosphate insecticides will be general themes of the third annual Mississippi Insect Control Conference at Mississippi State College, January 10-11, 1957. Announcement of the 1957 cotton insect control recommendations for Mississippi will be another conference highlight.

A panel discussion of insect resistance will have as members Dr. John Johnston of the National Cotton Council, moderator, Dr. Randle Furr, USDA Experiment Station entomologist at Stoneville, and A. L. Hamner, Mississippi Experiment Station entomologist at State College.

A discussion of the use of phosphates in cotton insect control will be the subject of a panel headed by O. T. Guice, general inspector, State Plant Board at State College.

Panel members and subjects are: Dr. Marvin Merkl, Experiment Station entomologist at Stoneville, research findings; S. L. Calhoun of Agricultural Chemical Company, Greenville, characteristics of phosphates; Ed Broadus of Niagara Chemical Division, Jackson, hazards of phosphates.

Mabry Anderson of Clarksdale, president, Mississippi Aerial Applicators Association, will lead a panel discussing problems of aerial application of insecticides.

A panel headed by C. C. Fancher, regional supervisor, Southeastern Plant Pest Control Region, at Gulfport, will discuss the functions and research findings of USDA entomologists on pests ranging from Mediterranean fruit flies, pink bollworms through corn insects.

Chairmanships of sessions will be handled by A. G. Bennett, extension entomologist at State College, Dr. Rose Hutchins, head, State Plant Board, State College, and Dr. Clay Lyle, dean and director, Division of Agriculture at Mississippi State College.

The annual conference will also include the annual business meeting of the Mississippi Entomological Association. David Young, assistant extension entomologist, and association president, will preside.

Also included in the conference will be general pest control, discussed by J. C. Redd, of Redd Pest Control at Jackson; fruiting habits of the cotton plant, by Mr. Hamner; and highlights of research in cotton insect control, discussed by Dr. Merkl.

NFSA Elects Crouse

E. E. Crouse of the CDK Liquid Fertilizer Corp., Liberty, Ind., was elected president of the National Fertilizer Solutions Association at the group's annual meeting in Sioux City, Iowa. Other officers elected for the 1956-1957 Association year were: vice president, Don Foster of Don Foster Nitrogen Solutions, Ottawa, Ohio; treasurer, John White, Auburn Fertilizers Co., Auburn, Nebr., and secretary, William B. Parish, Auburn, Ill.

The membership also voted to change the name from the original National Nitrogen Solutions Association to National Fertilizer Solutions Association, with the expectation of extending the program of activities to cover this entire field. At the board of directors meeting plans were made to activate an aggressive program for the coming year, looking toward greater service to the liquid complete mix fertilizer industry.

Report From Australia

A brief summary of developments in the use of the trace element molybdenum to improve agricultural practices in Australia, and an appraisal of opportunities for range improvement in the Hawaiian Islands with molybdenum, have been reported by George S. Cripps, manager of agricultural development for Climax Molybdenum Co., New York.

Mr. Cripps is attending the Seventh International Grassland Congress now under way at Massey Agricultural College in New Zealand. While in the Pacific area, he is making a survey of fertilizer practices in New Zealand and Australia, and investigating the need for land improvement in the Hawaiian Islands.

Mr. Cripps' next report will detail developments discussed at the Grassland Congress and his survey of New Zealand fertilizer practices.

Dieldrin Sent to Indonesia

The second part of a one hundred thousand pound shipment of dieldrin insecticide left San Francisco last month bound for Indonesia's spray-can army now fighting a house-to-house battle against malaria. The shipment brought the total amount of dieldrin sent to that country since May to 900,000 pounds. At that time the Indonesian government began a five year campaign to eradicate malaria-bearing mosquitoes from an area where 30 million people live. According to a report from Indonesia, the disease, which kills a person somewhere every ten seconds, accounts for a high percentage of the deaths in that country.

Dieldrin is manufactured by Shell Chemical Corporation. The shipments of insecticide from San Francisco were blended into required formulations at Olin-Mathieson's Fresno plant.

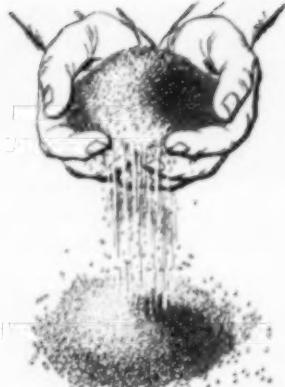
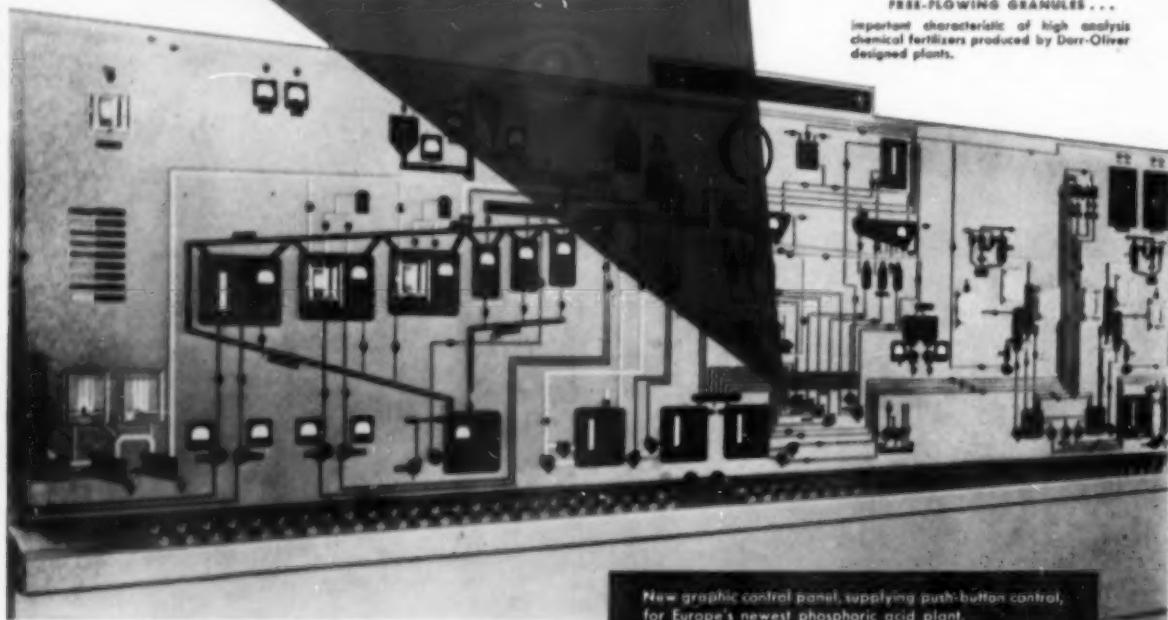
Calif. Weed Conf. in Fresno

The ninth annual meeting of the California Weed Conference will be held in Fresno, January 22 to 24, 1957, at the Civic Auditorium. Registration will be at the Hotel California, convention headquarters.

Topics to be presented include "Weed Problems of the San Joaquin Valley," "Weed Control in Crops and Non-cropped Areas," "Special Weed Problems and Their Solution," "Research in Weed Control on a State and National Basis," "New Developments in Weed Control," "Brush Control and the Economics of Weeds." A special address which should be of great interest will be on "Watershed Management in Relation to California's Water Supply," by William L. Berry, chief engineer, Division of Water Resources Planning, California Department of Water Resources.

Conference officers include James W. Koehler, president, California Department of Agriculture, Pomona; Vernon I. Cheadle, vice-president, University of California, Davis; O. A. Leonard, University of California, Davis; and J. T. Vedder, treasurer, Sunland Chemical Co., Fresno.

Nerve Center of Europe's Newest Phosphoric Acid Plant



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N.P.F.I. Analyzes Soil Bank Program

"THE Soil Bank program offers a challenge to the fertilizer industry in the year ahead," declared Russell Coleman, executive vice-president of the National Plant Food Institute, in an open letter to the industry last month. He pointed out that any potential loss in fertilizer sales as a result of the retiring of cropland now using fertilizer "can be more than offset" if the industry take full advantage of opportunities for increasing consumption.

The letter was a preface to a comprehensive study of the Soil Bank by the NPFI, based on available information and 1956 trends. The study, which he termed "a preliminary evaluation," was made in the knowledge that "The Soil Bank is likely to have an effect in one way or another on the operations of most members of the fertilizer industry during the coming year."

The study describes how in each state the Soil Bank is administered by a State Agricultural Stabilization and Conservation Committee (ASC), and in each county by a county ASC committee. The committee, which has been in existence for years, also administers price support and acreage control problems, and also the Agricultural Conservation Program (ACP).

The major parts of the Soil Bank, including the Acreage Reserve Program (ARP), and the Conservation Reserve Program (CRP), are explained. Under Acreage Reserve qualification "crops planted may not be harvested or grazed . . . The only required practice is the control of noxious weeds." To qualify for the Conservation Reserve, a farmer must establish "permanent cover or perform certain other specified practices on the land."

In an evaluation of the effects of these practices on national fertilizer consumption, the NPFI study predicts a net total national reduction for 1957 of about 400,000 tons, most of which it anticipates will be made up by increased usage under the Conservation

Reserve Program part of the plan. The study goes on to say "our analysis indicates that the net over-all effect of the Soil Bank on fertilizer consumption in 1957 will be a 0.5% increase."

"This would seem to indicate that the program will have little effect on fertilizer sales in 1957. Actually, consumption in many local areas will be affected substantially, and the effect on some individual plants could be serious. Also, the Soil Bank program undoubtedly will change crop patterns in many parts of the country, and therefore will tend to affect the kinds and types of fertilizer used."

The study says that history has shown that when the acreage of cultivated land is reduced under a control program, farmers generally tend to increase the amount of fertilizer used on the acres remaining. "Under the ARP this should hold true in the case of cotton, corn, wheat, rice and peanuts. The rate of fertilization in each of these crops still is far less than the optimum. . . . We believe that, with the exception of tobacco, which is much more heavily fertilized except in some areas, increased fertilizer usage on the acres remaining will offset much of the loss of those acres removed from the allotment crops."

"Most farmers in most areas of the nation will find it profitable to establish cover on land in the Acreage Reserve because (1) wind and water erosion will be more effectively controlled, (2) land will be built up for future production, (3) since the ARP contracts are expected to run for one year at a time, idled land can fit well into a rotation program, (4) adequate cover is an excellent means of weed control, and (5) Agricultural Conservation Program funds (\$250 million) may be used to reimburse farmers for a portion of the cost of establishing cover, including cost of fertilizer, on land idled under the ARP."

The study estimated the following effects on individual crops:

Wheat—it estimates that 13 million acres of wheat land will be

placed in the AR. Of the more than 10 million acres of winter wheat signed up in the AR so far, over 80% is in Kansas, Oklahoma, Nebraska, Colorado, and Texas. The study anticipated a fertilizer reduction of 150,000 tons, with a possibility of having serious effect on some plants dependent largely on wheat.

Corn—5.5 million acres will be placed in AR, with a potential reduction in fertilizer sales probably not greater than 100,000 tons. Most of this loss will probably be offset by increased fertilization rates on remaining acreage.

Cotton—an estimated 3.5 million acres will be removed from production, with a net loss of about 100,000 tons. 1.8 million acres of this will probably be in Texas and Oklahoma, which normally do not receive much fertilization. The 1.5 million acres from the Southeast "could result in an appreciable fertilizer loss."

Peanuts—only 200,000 acres will probably be removed, with a reduction of fertilizer usage of not more than 15,000 tons.

Rice—an estimated 250,000 acre loss, with 20,000 tons less fertilizer in use.

Tobacco—In the case of this crop, it is predicted that the greater part of reduction will result from lower acreage allotments, rather than as a result of the Soil Bank. Altogether, the Soil Bank is expected to reduce use of fertilizers by 20,000 tons.

The study found a number of extenuating circumstances that might push consumption upward. Among these are:

1. Assuming that all the money authorized for the Soil Bank is paid out in 1957, farmers are likely to have from \$500 to \$700 million in extra spendable cash income.

2. The possibilities for the use of fertilizer to establish cover on idled Acreage Reserve Land may be great.

(Continued on Page 105)

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N. E. Weed Control Conference in New York Jan. 10-12



The eleventh annual meeting of the Northeastern Weed Control Conference will be held January 10, 11 and 12, 1957 in New York City at the Sheraton-McAlpin Hotel. A number of papers will be presented in each of the following sections: Horticultural Crops, Agronomic Crops, Woody Plants, Public Health, Aquatic Weeds, and Extension. At the general session on the first day, some of the papers to be presented are: "Needs in Chemical Weed Control,"—W. B. Ennis, U.S.D.A.; "The Role of Herbicides in the Expanded Highway Program,"—W. C. Greene, Connecticut State Highway Dept.; "The Status of Herbicide Registration,"—E. A. Walker, U.S.D.A.; "Promising New Herbicides,"—R. J. Aldrich, U.S.D.A.; "Functions of the National Agricultural Chemicals Association in the Field of Herbicides,"—Jack Dreesen, Nat'l Agricultural Chemicals Asso.; and "The Place of Extension Methods in Chemical Weed Control,"—D. A. Schallock, Rutgers University.

Southern Weed Conference

The tenth annual meeting of the Southern Weed Conference has been scheduled for Jan. 23, 24, and 25, 1957, at the Bon Aire Hotel, Augusta, Ga.

The conference will hold morning and afternoon sessions during the three days and has scheduled the conference banquet for Thursday evening, Jan. 24.

Kraft Bag Appoints Belfit

The Kraft Bag Corp., New York, has appointed Ted Belfit sales representative in Pennsylvania, New Jersey and the Metropolitan New York area.

Executive Committee of the Northeastern Weed Control Seated, (l. to r.) I. R. Havis, Mass. Agr. Exp. Sta.; L. L. Danielson, Va. Truck Exp. Sta.; President of Conference; L. G. Utter, Diamond Alkali Co.; J. D. Van Geluwe, G.L.F. Co-Op. Standing, (l. to r.) R. J. Aldrich, U.S.D.A.; R. A. Peters, Conn. Agr. Expt. Sta.; D. A. Schallock, N. J. Agr. Exp. Sta.; C. L. Hovey, Eastern States Farmers' Exchange; R. J. Zedler, Carbide and Carbon Chemical Co.; and E. H. Rahn, Delaware Agr. Exp. Station.

FTC Cites Paper Company

The International Paper Co. has been accused by the Federal Trade Commission of violating the anti-merger law by acquiring the Long Bell Lumber Corp. The complaint said International already is the world's largest paper company and the merger might create a monopoly. John H. Hinman, chairman of International, has disputed the charge, saying that the two organizations have never been competitors. A hearing has been set for Feb. 12.

Miller Appoints Rouzer

Miller Chemical and Fertilizer Corp., Hanover, Pa., has appointed E. Russell Rouzer, former district manager, to the post of technical supervisor of liquid fertilizers. With Miller since 1947, he will be responsible for promotion and development of liquid fertilizers for ground application, and will coordinate research work to help growers determine the most effective and economical uses of liquid fertilizers.

TVA Offers Fertilizers

The Tennessee Valley Authority announced last month that interested fertilizer manufacturers in the U. S. (and outside the Tennessee Valley) can experiment with a number of new TVA fertilizers. The announcement said that for the coming season, interested companies can obtain up to 100 tons of the authority's newest fertilizer materials for use in the man-

ufacture of high analysis fertilizers, experimenting with new processes, or for making new products. The new products are calcium metaphosphate (with analysis of 60-62% available P_2O_5) and diammonium phosphate (with analysis of 21-53-0).

Amer. Ag. Changes Staff

The American Agricultural Chemical Co., New York, last month announced a number of staff changes in its Canadian and U. S. operations. J. E. Morgan, formerly superintendent of the Port Hope, Ont., plant, was named production superintendent for the firm's fertilizer plant at London, Ont. Succeeding him at Port Hope is S. J. Thompson.

D. W. Newbauer, formerly assistant superintendent at the Fulton, Ill., plant, is the new production superintendent at Cairo, Ohio. G. E. Richardson, who had been superintendent at the Columbia, S. C. plant, was appointed superintendent at the Charleston plant in the same state. G. L. Harris, formerly assistant superintendent at Pierce, Fla., succeeds Mr. Richardson at Columbia.

J. D. Mc Murray has moved from assistant manager of the Carteret, N. J. sales office to the home office fertilizer sales department in New York. Edgar B. Stalnaker of Baltimore, Md., succeeds him at Carteret.

F. H. Herold has been named chief chemist of the chemical control department laboratory at the East St. Louis, Ill. fertilizer plant. The laboratory also serves plants at Humboldt, Ia. and Fulton, Ill.

DDT Term'd Essential

Neely Turner of the Connecticut Agricultural Experiment Station recently reported at the National Audubon Society convention in New York that pesticides are essential to produce the quantity and quality of food and fiber our people want. Mr. Turner pointed out that the experiment station has been spraying thousands of acres of woodlands with tons of pesticides for 34 years, with no particular disturbance of wildlife recorded.

The economic entomologists at the Connecticut Agricultural Experiment Station have been on record as terming insecticides the "last step," to be taken only when serious economic losses cannot be avoided by studying the life history, parasites, predators, and diseases of insects.



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Pacific Northwest Garden Trade Show in Portland

By Charles Starker

THE sixth annual Northwest Garden Supply Trade Show, held October 23, 24th, at the Shrine Auditorium, Portland, Oregon, attracted a group of some 800 interested spectators from Oregon, Washington, Idaho and northern California. This year's show, sponsored by the Oregon Feed and Seed Dealers Association, had some 60 booths displaying a wide range of items of interest to the trade.

Sales Helps

In a talk "Techniques of Modern Merchandising," Mr. W. W. Marsh of W. W. Marsh and Associates, Portland, stated "The foundation for sales is based on advertising and publicity, market research, a sales program, personal selling and merchandising." His definition of merchandising was "A form of distribution, strategic action to get the right product into the right place, in the right quantity, at the right price at the right time, and in the right light."

New Products

"Vapam," Stauffers' new multi-purpose soil fumigant was the focal point of their display. Background photos showed results secured from use of this material for the control of Verticillium wilt on potatoes in Oregon, seedbed treatment for protection against seed and root pathogens (fungi), and soil insect pests. Consumer literature outlined other uses for control of certain nematodes, weeds and soil fungi.

A quartet of Aerosol bombs designed for home and garden use—"Scram" Dog Repellent, Home and Garden Bomb, an Indoor Plant Bomb and an Ant and Roach Bomb were displayed by California Spray Chemical. The "Ortho" Room Divider was the center of interest in their exhibit. This piece of furniture can be used in retail stores as a display stand, for a gardeners' spray center, or for garden show use, or as a buffet stand or room divider in the home. Directions for construction of the stand are included in the recently issued Ortho Garden Book, which also gives lucid and com-

plete directions for control of insect, fungi and other pests commonly found in the garden.

Diamond Black Leaf's display included their new "Black Leaf 40" which is claimed to be twice as effective as the previous formulation, a double duty aerosol, "PFFT" (pronounced "fit") for household pests and garden insects, and a pelleted Warfarin bait for rat and mouse control packed in a handy cardboard container which can be changed to a useful "bait station" with two knife cuts.

American Chemical Paint's attractive display featured a new polyethylene plastic "squeeze type" duster for dispensing rose dust. A recently released poison oak killer was also included along with some of their more familiar products.

In addition to the chemicals, H. D. Hudson Co., San Francisco displayed a representative line of their sprayers, and Leo Cook Co., of Portland had an interesting lay-out on Panogen treaters, liquid Panogen, and Drinox, a 30% Aldrin solution for companion use with Panogen for combination wireworm and seed fungicide use.

Frank Stewart, Miller Product Company, Portland, Oregon will be trade show committee chairman for the 1957 show.

NH₄-PO₃-NO₃ Production

Charles H. Young, TVA's manager of chemical engineering, said last month he believes that ammonium phosphate-nitrate fertilizers are ready for large-scale production in the United States and that "considerable technical information regarding processes TVA has developed" is available to industry. These fertilizers, he said, are high in plant-food content.

"We believe we have enough technical information concerning equipment and processes to guide others in starting production," Mr. Young said. "Several fertilizer companies have done experimental work on ammonium phosphate-nitrate but,

so far as we know there is no actual production in the country. We do not know whether any companies now are planning such production. One Canadian company has been shipping a 27-14-0 product (27 percent nitrogen, and 14 percent phosphate) into the country.

"Because ammonium phosphate-nitrate can be made from numerous readily available raw materials and by a variety of processes, and because the products are concentrated and effective fertilizers, we believe there are opportunities for private firms in the production of such fertilizers. This is particularly true since we have found it practical to make ammonium phosphate-nitrate in the continuous ammoniator, which TVA developed, and which is becoming standard equipment in many fertilizer plants."

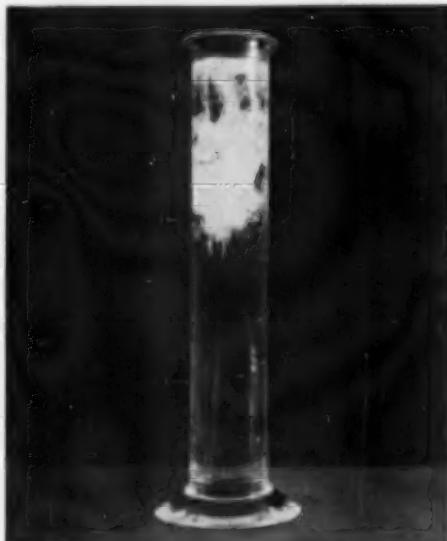
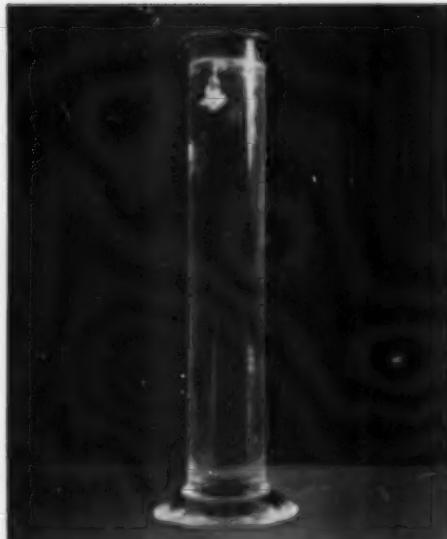
Jefferson Expanding Plant

The Jefferson Chemical Co., Houston, Tex., has started a major expansion of its petrochemicals plant at Port Neches, Tex. The expansion will triple the company's production facilities for ethylene and permit Jefferson's entry into new fields based upon ethylene.

Congo Pyrethrum Plant

The Belgian Congo's first pyrethrum extraction plant, Chimiphar, at Bukavu, started production on a site that until recently was a forest of wild banana trees. It is under the direction of Alois Saelens, its builder and owner, who last month arrived in the United States to confer with American pyrethrum processors who depend on African sources of the insecticide constituent.

Mr. Saelens stated that his installation is prepared to extract pyrethrins, the active ingredient of the pyrethrum flowers, from 2.7 million pounds of blossoms a year. He said that extraction of pyrethrins from the flowers at the point of growth makes unnecessary the shipment of bailed flowers and greatly reduces shipping costs. The United States imports virtually all of its pyrethrum requirements from either British East Africa or the Belgian Congo.



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AGRICULTURAL CHEMICALS

NSC Fertilizer Section Reviews Accident Prevention

By H. H. Slawson

DISCUSSION of accident prevention in fertilizer plants from the viewpoint of top management, the supervisor and the worker, marked the opening session of the National Safety Council's fertilizer section at the National Safety Congress in Chicago, Oct. 22. New chairman of the fertilizer section for the coming year is E. O. Burroughs, Jr., F. S. Royster Guano Co., Norfolk, Va. He succeeds Curtis Cox, Virginia-Carolina Chemical Corp., Richmond, Va., who became a member of the executive committee. For vice chairman of the section George F. Dietz, Fertilizer Manufacturers Cooperative, Baltimore, Md., was selected and G. L. Pelton, Smith Agricultural Chemicals Co., Columbus, O., was named secretary.

Before relinquishing the gavel to the new chairman, Mr. Cox was presented with a plaque expressing the appreciation of the National Safety Council for his services in promoting safety during his term of office. Presentation was made by Vernon S. Gornto, Smith-Douglass Co., Norfolk, Va., a past general chairman of the section.

Addressing the safety council, H. B. De Vinny, Davison Chemical Co., Baltimore, Md., emphasized top management's part in the plant safety program, with the declaration that "Safety of the worker must be the primary consideration of the men who make the company's policies."

Top safety records, Mr. De Vinny declared, bring prestige to any company and are also financially rewarding through insurance refunds and lowered rates. Just before he started out for the Chicago meeting, he said, his own company received \$65,000 back from its insurance carrier.

As a variation of the familiar slogan "The life you save may be your own," Mr. De Vinny suggested adoption of the slogan "Plant safety may save my business." As the one guiding thought of top management, he emphasized, there must be a realization that "our plant must be a

safe place to work in." Safety must be indoctrinated into everybody all down the line and, if the program is not to bog down, constant analysis must be made of every accident and injury to determine where more attention is needed to preventive measures.

Consumers Cooperative Association has the problem of promoting an effective safety program in more than 30 facilities spread over 9 states, J. Lauren Shopen, safety director of this farm supply procurement organization, explained in a report on "The Safety Director in a Multiple-unit Organization." Unity, he said, is achieved with a standardized "remote control" system administered from the co-op's Kansas City headquarters.

C. S. Griffith, superintendent of Virginia-Carolina Chemical Corp's fertilizer division at Cincinnati, O., related how up to four years ago, his men really knew or cared very little about safety. They went to safety meetings, yes, but mainly because these meetings on company time gave them a chance to get out of work.

Then his company joined the National Safety Council's fertilizer section, he said, and in attending the meetings in Chicago learned how to really sell safety to the employees by making their plant safety meetings interesting and valuable. In the reorganized committee, with representation from every part of the plant, the men themselves drew up regulations, launched inspections to uncover hazards and even explored lockers to bring to light discarded clothing that had been stored in them for years.

Chairman-elect E. O. Burroughs, Jr., in brief remarks raised the question of whether there really is any profit in an accident prevention program. Answering it himself, he pointed out that in the five or six years since the fertilizer section has been operating the compensation rate in New York state has dropped 40 percent.

He offered, too, the further fact that G. L. F. Exchange of Ithaca, N. Y., employs about 30 percent of the fertilizer manufacturing labor in New York state. Furthermore, he pointed out, G. L. F.'s personnel manager, Tom Clarke, has been a former chairman of the fertilizer section, where he has been tremendously effective in spreading abroad the new concepts of accident prevention in fertilizer plants.

He conceded that it might be difficult to connect Mr. Clarke's activity with the 40 percent drop in rates in his home state. But at any rate, he declared, these facts do indicate that close attention to accident reduction will show a profit.

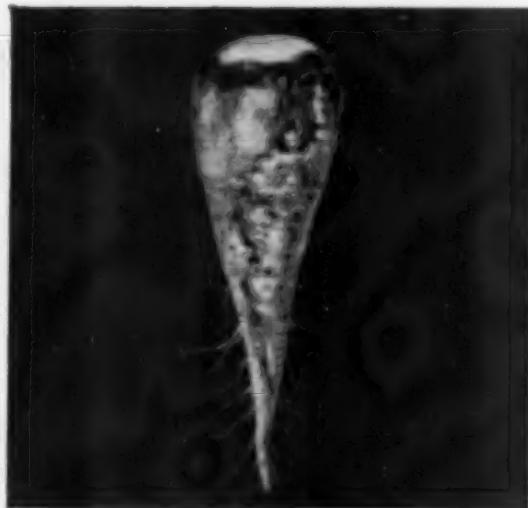
H. S. Baucom, safety director, North Carolina Industrial Commission, Raleigh, N. C., declared the problem of promoting safety is far from easy because it requires a realization of the need for accident prevention before anything can be done about it. "We have to sell safety," he said, "to men who already have arms, already have legs, eyes and lives, and that job calls for super-salesmen."

In North Carolina, Mr. Baucom said 70 percent more men go to the first aid room on Monday than on Wednesday; more accidents occur in August than in any other month. "And there's a reason for all this," he added. "Encourage your men to live wholesome lives on week ends and vacations. Let them know you know the score."

He outlined a safety program in five words: *Eliminate*—(get rid of hazardous conditions leading to accidents); *Guard*—(if you can't eliminate the hazard, guard it); *Protect*—(with shoes, goggles, etc); *Regulate*—(with adequate safety rules); and, finally, *Educate*—(teach how to recognize hazards and methods for doing the job safely.)

"We've got to get this down to the workers," said Mr. Baucom. "We've got to make them realize that their own lives depend on themselves, not on what the boss says. We must make them understand that the rules are for their own protection."

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Meyer Lists Staff Changes

Wilson & Geo. Meyer & Co., San Francisco, recently announced a number of appointments and transfers to keep pace with the increased demand for agricultural chemicals in the West. Philip A. Sawyer, of the Los Angeles staff, was named assistant manager in agricultural chemical sales for the Southwest territory. Richard T. Swanson, Jr., was transferred from San Francisco to the Los Angeles area to take charge of peat moss sales. Donald Deggendorf joined the San Francisco staff and Leland Oberholser joined the Los Angeles staff.

Koehring Announces Merger

The Koehring Co., Milwaukee, manufacturer of excavating and hauling equipment, will acquire the Buffalo-Springfield Roller Co., of Springfield, Ohio, on Dec. 1. Terms of the merger, which will be accomplished through an exchange of Koehring common and preferred stock for Buffalo-Springfield outstanding stock, provide that the acquired company operate as a division of Koehler.

'54 Fertilizer Census Out

The advance report of "1954 Census of Manufactures" was issued recently by the U. S. Dept. of Commerce, Washington. A considerable portion of the report's section on gums, wood chemicals, and fertilizers is devoted to the fertilizer industry.

The report reveals that of the total amount of fertilizers shipped in 1954 (\$855,196,000), \$602,560,000 consisted of complete mixtures. Only \$12,537,000 of the total figure consisted of fertilizer materials of organic origin.

A. Bourne, Entomologist Retires

Arthur I. Bourne, research entomologist at the College of Agriculture, University of Massachusetts, Amherst, retired Oct. 31 after 46 years of service. He joined the University in 1910 as an assistant in the Mass. Agricultural Experiment Station, and since 1930 had been head of experiment station entomology.

Mr. Bourne has served as co-chairman of the Eastern Pest Con-

trol Operators Conference since its founding in 1940, and in that year was elected to honorary membership in the National Pest Control Association. He is also a member of the Entomological Society of America.

Boswell Joins Nat'l. Potash

William C. Boswell recently joined the National Potash Co., New York, as representative in the south and southwestern states. He will cover the states of Mississippi, Louisiana, Texas, and Arkansas, making his headquarters at National's Montgomery, Ala., office.

Fluor To Enter Chem. Field

The Fluor Corp., Ltd., Los Angeles, announced recently that its research division will actively seek industrial contract research in the chemical and petrochemical industries for the first time in the firm's 66-year history. In the past, such activities have been handled by organizations devoted exclusively to research. According to the company announcement, projects range from laboratory experiments to economic evaluations, and include the design and operation of pilot units and the solving of plant problems.

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OPERATING EASE—The operator places an empty bag on the filling tube and starts the cycle by depressing the foot switch... that's all. The bag holder opens automatically when the filling cycle is complete. All controls are at eye level.

BEMIS VICON® FEEDER—A unique means of moving products from supply hopper to scale beam; a two-stage pulsating feeder tray first feeds rapidly, then at a rate which can be controlled for accuracy. When the exact weight is reached, the feeder cuts off and the filled bag is deposited automatically on the sewing machine conveyor.

CAPACITIES—From 25 lbs. to 150 lbs. Easily adjustable for varying bag sizes.

TAKES LIMITED SPACE—Width, 26"; depth, 42"; maximum over-all height, 97½"; minimum, 76".

LIGHT AND PORTABLE—Shipping weight, 600 lbs. Portable mounting for use in various locations.

NO INSTALLATION SERVICE—Just move it in and plug into a 110-volt, 60-cycle line. All electrical equipment enclosed in cast-iron explosion-proof boxes.

Soil Fertility Conference Held in Atlanta

PASTURES and hay lands constitute the most neglected segment of our agriculture, Dr. L. B. Nelson, head of the Eastern Section, Soil and Water Conservation Research, ARS, USDA, told the first annual Southern Soil Fertility Conference at Atlanta last month. "The potentials for fertilizer on pastures and hay lands during the summer and fall months are particularly great."

He pointed out that soils are in better condition in the fall of the year to accommodate application equipment. "All too frequently," he declared, "small grains and winter cover crops are not adequately fertilized at time of planting."

The conference, sponsored by the Southern Regional Soil Research Committee, and the National Plant Food Institute, was held at the Atlanta-Biltmore Hotel on Nov. 2.

W. R. Thompson, Mississippi State College, further pursued the theme of the necessity for forage crop fertilization. He declared that "it pays to band seed and place fertilizer on most of our pasture grasses, clover, and legumes.

"The sod seeding principle has almost year-round use in the pasture program. Planting, using this principle, starts in March in seeding Dallis, Bermuda, Bahia, annual lespedezas and Sericea lespedeza. Following the harvest of small grain, hay or silage in the spring, Sudan, millet, sorghum, and grain sorghum are planted, putting down fertilizer at the same time.

Dr. M. S. Williams, chief agricultural economist of the NPFI, urged that acres placed in the soil bank can be considerably enhanced in value with sound land management, including the application of needed plant food. He went on to declare: "With the price-cost squeeze still a problem, more than ever before we must avail ourselves of every opportunity to lower the per unit cost of production. Farmers should study the 'soil bank' provisions in light of their own farming operations and they should adapt to their farms those

provisions which improve their overall economic wellbeing."

Dr. J. W. Fitts, head, Dept. of Soils, N. C. State College, praised the value of soil testing.

"Southern states were among the first to adopt the practice of bolstering crop yield through use of commercial fertilizers," Dr. Fitts continued. "Through the years a great multitude of grades were offered for

sale, and recommendations differed from one state to another. In order to protect both the consumer and manufacturer, some states passed laws relative to the sale of mixed fertilizers. Differences still exist, however, in recommendations across state lines.

O. M. SCOTT & SONS, Marysville Ohio, producers of grass seed and garden chemicals, recently elected C. B. Mills board chairman and P. C. Williams president and treasurer.

TYPE 41 CLAY

In making organic concentrates using benzene hexachloride, chlordane, toxaphene, and other similar materials, it is important to have the concentrates free flowing.

TYPE 41 Clay can be combined with more costly diluents, such as Fuller's earth, and the result will be a free-flowing concentrate, at a lower cost to the producer.

TYPE 41 Clay has the following advantages:

NON ABRASIVENESS

FINE PARTICLE SIZE

ABSORBTIVENESS

PROPER BULK

HIGH INSECTICIDAL VALUE OF CLAY ITSELF

LOW PH VALUES

NO PHYTOTOXICITY TO PLANTS

OUTSTANDING ABILITY TO STICK TO THE LEAF

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Aiken, South Carolina



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OF POTASH
for the
PLANT FOOD INDUSTRY

THIS symbol stands for high-grade coarse and uniform Muriate of Potash (60% K₂O minimum). Southwest Potash Corporation provides a dependable supply of HIGH-K* Muriate for the plant food industry.

*Trade Mark

**Southwest Potash
Corporation**

Ohio Liquid Nutrient Plant

A new liquid fertilizer manufacturing plant at Plain City, Ohio, is expected to go into production about Dec. 1. Henry Troyer and Sons are the owners and operators of the new installation, which is being engineered by Ellsworth Equipment & Engineering Co., Indianapolis.

The plant will have a capacity of 15 tons per hour, and will utilize the new Ellsworth salting-out depressants. Sales will be handled through local elevators and dealer applicators.

Nat'l Potash Names McBride

John J. McBride has joined the National Potash Co., New York, as traffic manager. He was formerly assistant traffic manager with the Mutual Chemical Division of Allied Chemical & Dye Corp., New York, and prior to that served as traffic assistant for Standard Milling Co. He is an instructor at the Academy of Advanced Traffic, New York, and is a member of the Association of Interstate Commerce Practitioners.

Int'l Paper Approves Merger

Stockholders of the International Paper Co., New York, last month approved a merger with the Long-Bell Lumber Corp., and the Long-Bell Lumber Co., a transaction that will involve a conversion of Long-Bell stock into 850,000 shares of International Paper common stock. An International official said that the stockholders action means that the company can proceed with plans for construction of a new bleached and unbleached paper and paperboard mill in Oregon.

Iowa Ammonia Dealers Meet

Matt Sylvan of Blencoe was elected president of the Anhydrous Ammonia Dealers of Iowa at their recent meeting in Des Moines. Other new officers are Howard Greiner, Keota, first vice-president; Pat Burnett, Storm Lake, second vice-president; Russ Legreid, Mason City, third vice-president; and Dwight Bell, Audubon, secretary-treasurer.

Equipment AND BULLETINS

Fulton Introduces Valve Bag Packer

The new line of valve bag packers recently introduced by Fulton Bag & Cotton Mills, Atlanta, is designed to fill valve bags with powdery, granular, or bulky materials. One of its key features is a removable steel jacket, which provides maximum operator safety and protects parts.

Depending on the material, its filling screw provides rapid flow (it fills one cubic foot every five to ten seconds) and reduces jamming. The exclusive "Ful-Pac" scale beam points are said to insure accuracy within ounces—plus or minus 0.5%.



The new Fulton packer is shown at left in its steel jacket. The unit pictured is 54 inches deep, 52 inches high, and 24 inches in width. Pushbutton controls are located next to the delivery spout.

The Ful-Pac line includes three models, the F-50-V, F-50-1, and the F-50-D, the latter equipped with dual spouts. A special agitator, driven by a sealed gear reducer, and the special wide mouth hopper are engineered to insure free flow of the material being packed.

Another feature of the Fulton unit is a fully-adjustable bag rest saddle. Standard screws and spouts are available in sizes to fill 3½", 4½", 5¼" and 6" valve bags; and other attachments are available for filling open mouth bags, barrels, and drums.

New Type Spray Gun

The R. C. Can Co., St. Louis, fiber container manufacturers, recently introduced a new insecticide spray gun equipped with a directional vent that enables the user to direct the spray at an extreme angle. Among



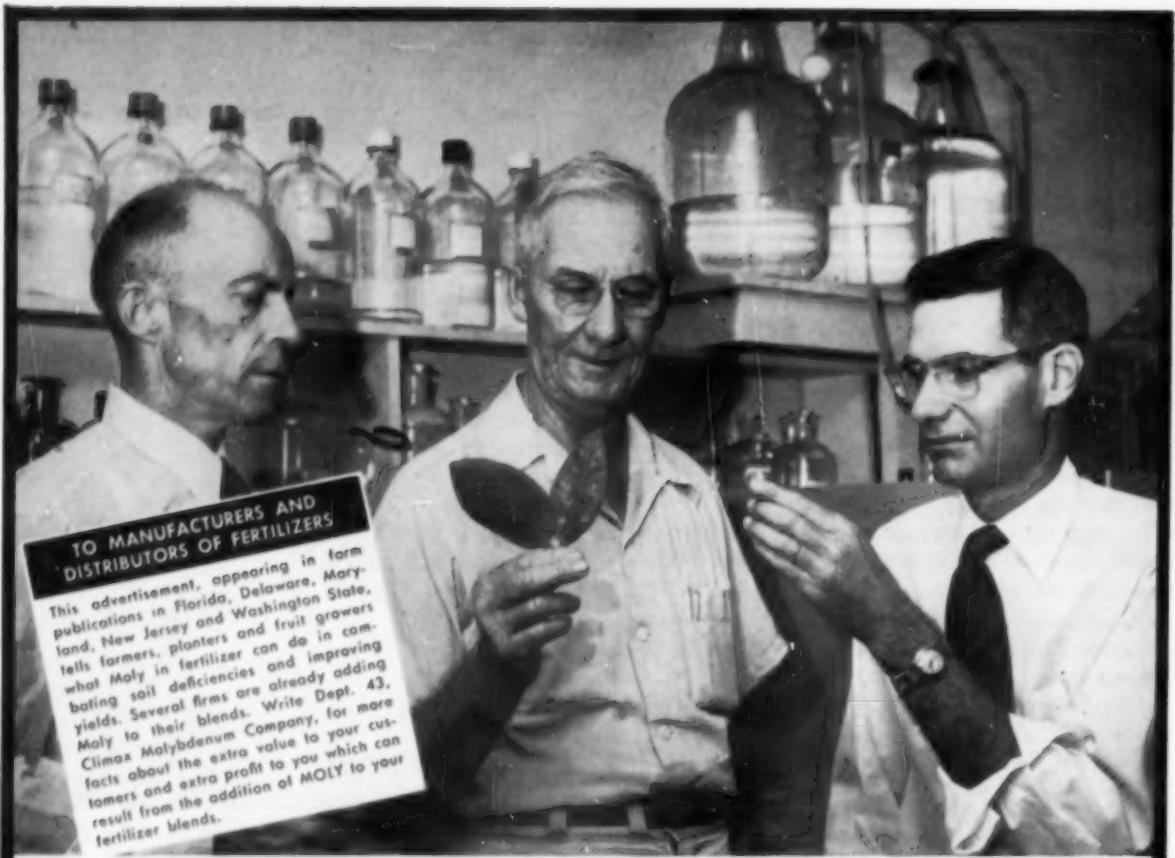
the gun's other features are an anti-clog feed device, a removable top that permits easy refilling, a bellows valve, and a wax coated inner tube that permits easy pumping.

Copper Oxide Booklet

The Calumet Division of Calumet & Hecla, Inc., Calumet, Mich., has announced a new booklet on "Calumet Brown Copper Oxide Fertilizer Grade" for the agricultural market. The booklet highlights research and experimental programs, and lists carrots, lettuce, onions, beets, cauliflower, and many other truck crops, grasses and grains as those crops showing a particularly marked response to copper treatment.

New Richardson Bulletin

A new high-speed fertilizer bagging scale, capable of bagging up to 24 sacks per minute, is described and illustrated in No. 5601, a new product data sheet recently issued by Richardson Scale Co., Clifton, N. J. A separate table is included, listing key specifications.



C. D. Leonard, L, and Ivan Stewart, R, Florida Citrus Experiment Station, talking with A. C. Mathias, citrus grower. Doctors Stewart and Leonard established the fact that yellow spot on citrus leaves is

caused by molybdenum deficiency. They also showed that moly spray effects a rapid recovery of citrus trees affected by this deficiency disease. Many Florida citrus growers are now using molybdenum.

Florida experience shows how Moly controls crop disease

Water soluble Molybdenum can be spray-applied alone or mixed with other sprays.

Yellow spot on citrus leaves is caused by molybdenum deficiency, research discloses, and it can be controlled by spraying affected trees with sodium molybdate. Now Florida citrus growers are using molybdenum for the control of yellow spot.

All crops need moly—Other scientific tests conducted by experiment stations over the past 15 years have shown that moly is needed in *all* crops. If molybdenum is not present in the soil in a form *available* to plants, then it should be added. In legumes moly fixes nitrogen in root nodules. Moly acts in all crops to reduce nitrogen in the leaves. With such varied crops as tobacco, sugar beets,

tomatoes, broccoli and rutabagas, added traces of moly make the difference between scanty growth and vigorous, healthy yields.

County agents can help—It may be that your own soil is deficient in available moly. Your county agent or soil conservationist will be glad to talk with you about the problem. Write for our bulletin, "Testing for Molybdenum Deficiency". Climax Molybdenum Company, Dept. 43, 500 Fifth Avenue, New York 36, N. Y.

MOLYBDENIZED FERTILIZERS
are made by
Davison Chemical Company
Division of W. R. Grace & Co., Baltimore, Md.
The Summers Fertilizer Co., Inc. McKeesport, Pa.

CLIMAX MOLYBDENUM

Pronounce it: Mo-LIB-de-num or call it Moly

Fluor Research Bulletin

A new 12-page, two-color bulletin describing the research facilities of the Fluor Corp., Ltd., Los Angeles, was published recently by that company for the agricultural chemicals industry. It describes the various services offered by the firm's research staff, which was recently made available to industry on a contract basis for the first time in Fluor's 66-year history. The bulletin also contains a number of case histories of recent research and development projects, and includes a series of photographs of the technical equipment.

Device for Screening Fumigants

A satisfactory solution to the problem of disinsectizing aircraft would be to circulate in the air-conditioning system a fumigant that is nonirritating and harmless to passengers and crew (2, 3). To aid in the search for such a fumigant a new device for screening solid or liquid insecticides with a relatively high vapor pressure was developed. This device is simple, easy to clean, inexpensive, reduces contamination, speeds tests, and is compact and portable. Because it is a closed system it cuts down toxicity hazards and lends itself to thermostating. The results are more reproducible because of agitation. By W. N. Sullivan, E. O. Haenri, and W. A. Affens. ARS-33-32 Bulletin, Nov. 1956.

Hardinge Mill Bulletin

Hardinge Company, Inc., York, Pa., has issued a six-page brochure, Bulletin AH-474, covering its major types of reduction mills for both wet and dry grinding and pulverizing. Briefly described are the firm's tricone, rod, cylindrical, tube, batch, conical and disc-roll mills. Materials which have been dry or wet-ground in these mills are also listed, and there is a brief description of grinding mill accessories and classifying devices.

New Farmer Bulletins

The I. P. Thomas Division of Pennsalt Chemicals, Philadelphia, recently announced that a new series of bulletins covering a wide variety

of agricultural subjects will be distributed to farmers in New York, New Jersey, Pennsylvania, and Delaware. Specific information will be given in bulletins covering crop cultivation, fertilizers, irrigation, seed treating, and related topics. The first series of three Farm Service Bulletins, "Soil Sampling for Soil Tests," "Granular or Pelletized Fertilizers," and "Organic Matter," is available on request from I. P. Thomas Division, Dept. B, Pennsalt Chemicals, 3 Penn Center Plaza, Philadelphia 2.

Panogen Conversion Kit

Change-over of dust seed treaters to handle ready-mixed liquid seed treating chemicals is readily effected through use of a new conversion kit manufactured and sold by Panogen, Inc., Ringwood, Ill. Chief advantages claimed for the kit are that it requires only a few minutes to install, converts standard dust treaters so they can be used for liquid Panogen, permits accurate regulation of dosage, and eliminates dust. Retail price is approximately \$40.



New Modern Plant Where SER-X is Produced

SER-X is a potassium hydrous alumina silicate of the following analysis: SiO_2 73.08%, Al_2O_3 13.70%, Fe_2O_3 3.12%, TiO_2 0.54%, CaO 0.30%, MgO 1.14%, Na_2O 0.22%, K_2O 5.42%, Ign. Loss 2.54%, Fusion Point Cone 12.

Processed from Sericite ore, **SER-X** has an average particle size of 3.5 microns and a bulk density of 40 pounds per cubic foot. **SER-X** is inert, non-hydroscopic and non-shrinking. The particles are flat. Because of these physical and chemical properties it has proved ideal as a diluent in the formulation of agricultural insecticide dusts.

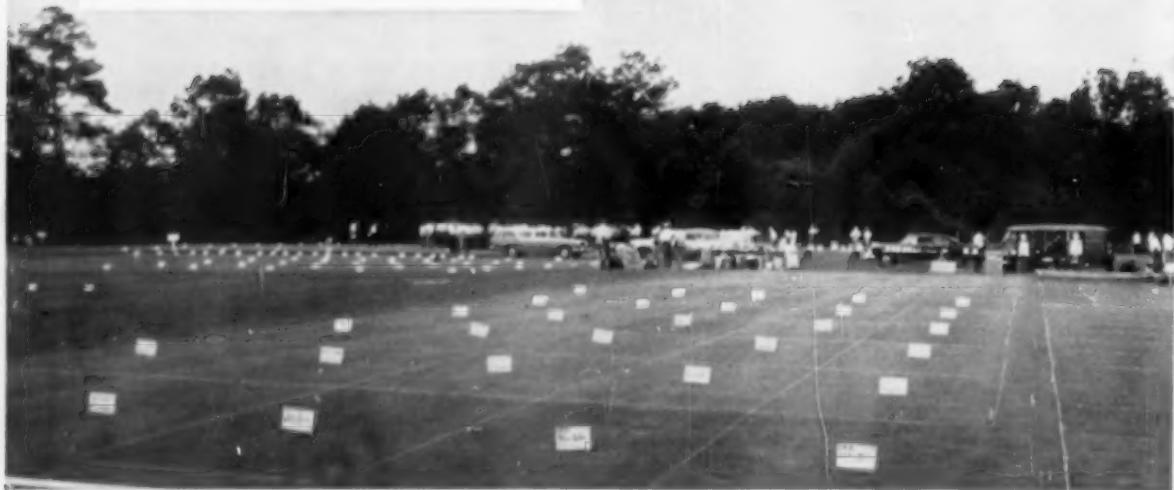
For Technical Literature and Samples, Write Dept. AC 1

The **SUMMIT** of **QUALITY**
 The Test Proven
 Insecticide Diluent Formulators Report
 Excellent Results

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 BASHORE BUILDING CARLISLE, PENNSYLVANIA

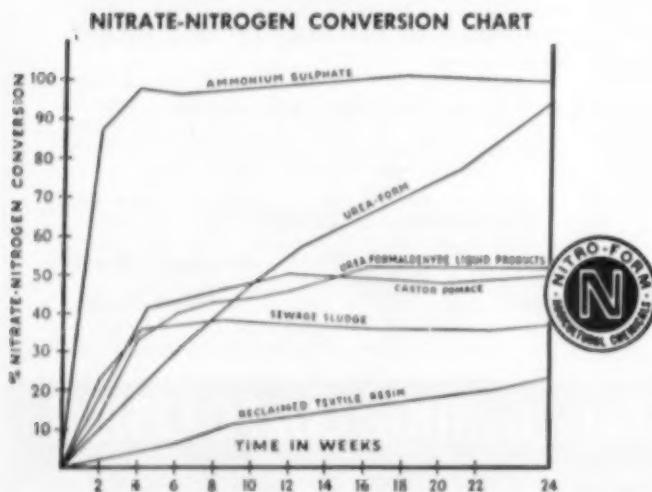
**Actual Field Tests
Prove UREA-FORM Best!**



**More and More Specialty Fertilizer Manufacturers
are using NITROFORM®**

Nitroform has so many distinctive advantages it's no wonder more and more fertilizer manufacturers are using this solid Urea-Form in their mixes.

Don't be misled by other forms of urea-formaldehyde. Make sure that the Urea-Form you are using in specialty fertilizers passes the accepted A. I. test for nitrogen availability. Results count. The chart below illustrates the release of available nitrogen of Urea-Form in comparison with less desirable substitutes.



Why NITROFORM?

- ▶ it mixes easily . . . is now available in a colored granular or powder form.
- ▶ is clean, odorless, non-leaching and non-burning.
- ▶ is economical, and offers larger profits in mixed fertilizer sales.
- ▶ is field test proven . . . to meet specific nitrogen requirements of Urea-Form.

Write now and let us give you complete facts and figures on how NITROFORM can increase your sales and profits.



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AGRICULTURAL CHEMICALS, INC.

A DIVISION OF

Woonsocket Color & Chemical Co.
92 Sunnyside Ave. • Woonsocket, Rhode Island

AGRICULTURAL CHEMICALS

Introduce New Bulk Weigher

The Toledo Scale Co., Toledo, Ohio, has just introduced a new bulk weigher that provides remotely printed and totaled net weight records of bulk material. The unit has a capacity of 50,000 pounds per hour, with the individual drafts of material weighing 1000 pounds each. It is reported, however, that capacities range up to 2 million pounds per hour to meet individual requirements.

The company points out that the system is unique in that only the actual net weight discharged is added to the cumulative total, and any amount sticking to the hopper is compensated automatically. By printing the weight of the draft before discharge, and again after discharge, the weight of any material left in the weight hopper is subtracted automatically, giving an accurate net weight of the material of flow discharged.

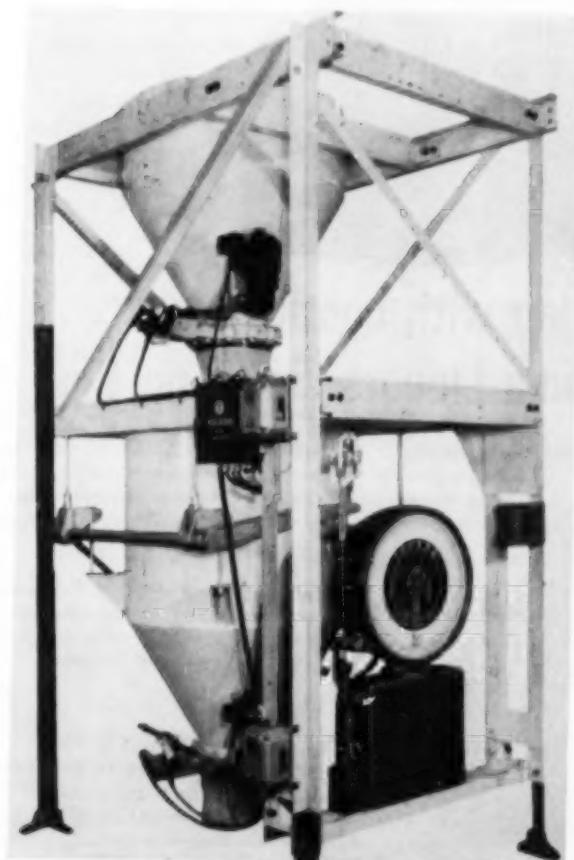
The basis of the unit is a Toledo suspension-type hopper scale from which is mounted a weight hopper. Above the weigh hopper is a surge

hopper, which receives the material and dumps it into the weigh hopper. Both hoppers are equipped with pneumatically-operated discharge gates, and the scale indicating mechanism is equipped with a cutoff device.

Cyanamid Expands Amanol

American Cyanamid Co., New York, has announced the addition of three new formulas to its "Amanol" solutions line in a move to meet fertilizer manufacturers requests for more concentrated liquid nitrogen solutions, and to provide freight savings. The new solutions are Amanol 70-24 and Amanol 60-28, containing 44% actual nitrogen, and Amanol 68-26, containing 45% actual nitrogen. In Cyanamid's designations, the first number refers to the ammonium nitrate content, and the second to the anhydrous ammonia content.

Cyanamid had previously been offering four other Amanol solutions — 65-22, 55-26, and 61-24, containing 41% nitrogen, and 60-34, containing 49%.



In Toledo's automatic weighing, recording, and totalizing system, printed and totalized net weight records of bulk material received, or going into truck or carload shipments are provided. Fulton Bag's deluxe screw-type packer is shown as it is encased in its removable steel jacket to provide maximum safety and protect machine parts.

General Pump Bulletin

Dorr-Oliver, Inc., Stamford, Conn., has issued a new general bulletin, "Application Engineered," describing the characteristics, materials of construction, types, sizes and capacities of the six major Dorr-Oliver pumps for the chemical industries. The bulletin is available from Dorr-Oliver, Inc., Barry Place, Stamford.

New Potato Defoliant

The Chemical Insecticide Corp., Brooklyn, has issued a bulletin describing "Chem Sen 56 Potato Top Killer" which is specifically compounded for faster and longer lasting kill of vegetation, and makes possible more efficient potato harvesting.

Gro-Green in New Container

H. D. Campbell Co., Rochelle, Ill., are offering a ready-to-use Gro-Green liquid plant food in a household-size plastic squeeze container. Packaged in a four-ounce size, it is designed for the feeding of potted plants, flowers, and similar small-scale household uses. The nutrient is sprayed on the leaves of the plant after watering, and contains "Foliage Dietene," a new ingredient which is said to break down the surface tension to allow leaf feeding.

New Oxides From Becco

Two novel epoxy compounds, dipentene monoxide and alpha-pinene oxide, are now available in experimental quantities from Becco Chemical Division of Food Machinery and Chemical Corp., Buffalo, N.Y.

Both dipentene monoxide and alpha-pinene oxide are suggested for use as intermediates in the manufacture of insecticides, perfumeries, pharmaceuticals, and bactericides; as reactants in organic synthesis, and as solvents.

Becco dipentene monoxide combines the reactivity of any epoxy group with that of an olefinic double bond in a cyclic terpene molecule. It is a water-insoluble, solvent-soluble liquid of characteristic odor. It undergoes all the reactions typical of the epoxy group and the external double bond of the terpene molecules.

JANUARY							FEBRUARY							MARCH							APRIL						
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23	24	25	26	27	28	29	28	29	30	31				25	26	27	28	29	30		23	24	25	26	27	28	29



Schedule your production with confidence—

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When you order Du Pont UAL, you can depend upon prompt delivery, regardless of the time of year. This dependable service assures you smooth, economical plant operation.

There are four formulations available, including UAL 37, a special composition that provides slowly available nitrogen. For technical assistance and information on the solution best suited to your use, write Du Pont.

Works Well in Granulation—UAL is safe in the granulator, even with concentrated acids; gives hard, uniform, stable granules, best for storage, application.

Flexibility—UAL can be readily used for either batch or continuous mixing.

Excellent Conditioning—UAL speeds curing, gives mixed goods better "feel" — minimizes caking, segregation and dusting.

Non-Corrosive—UAL can be used in any normal fertilizer manufacturing equipment including ordinary steel. (The mild steel tank car shown above has carried UAL for 23 years.)

High-Quality Nitrogen—UAL furnishes nitrogen of superior agronomic value. Resists leaching, has the advantages of both urea and ammonia nitrogen.



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News Brevities

MENZA L. HEAD, vice-president and manager of the Alabama Fertilizer Co., Montgomery, from 1925 through 1949, has purchased the business from the estate of John R. Hudson.

AC

DR. JOHN A. RIDDELL, plant physiologist, has joined the agricultural chemical research and development staff of the Naugatuck Chemical Division, United States Rubber Co. His headquarters will be the company's agricultural experiment station in Bethany, Conn.

AC

ROBERT W. LEA, who retired as president of the Johns-Manville Corp. in 1951, died of a heart attack recently in New York. His age was 70.

AC

QUENTIN CUNNINGHAM of Pittsburgh and the Engineering Corp. of Baltimore have been appointed sales representatives for Dorr-Oliver, Inc., Stamford, Conn. Both organizations will be exclusive representatives in their respective areas and will market, stock and service Dorr-Oliver pumps for the chemical and allied industries.

AC

ROBERT C. HICKERSON was recently named to the staff of the market development department of Tennessee Products & Chemicals Corp., Nashville. For the past six years he served as a project engineer in the company's Research Department.

AC

JOHN F. DONAHUE, FORMERLY supervisor of the agriculture chemistry laboratory of the State Department of Agriculture of Oklahoma, was recently appointed to the research staff of Chemagro Corp., Pittsburgh.

AC

ROBERT W. WINTERS has joined the Crag Agricultural Chemicals Sales Department of Carbide and Carbon Chemicals Co., New York, a division of Union Carbide and Carbon Corp., as a technical representative.

MEAD Corp., Atlanta announced plans to spend more than \$20,000,000 to expand its Kraft paper mill at Rome, Ga.

AC

ROBERT F. HALL has been named technical service director of the calcium products division of the Georgia Marble Co., Tate, Ga.

AC

DR. FREDERICK C. HAHN, assistant to the research director of E. I. duPont de Nemours & Co., Wilmington, died Nov. 3.

ALFRED J. DICKINSON, vice president in charge of purchasing since 1952, has been named assistant to the president of Virginia-Carolina Chemical Corp., Richmond, Va. Mr. Dickinson, who joined V-C in 1939, will continue as a vice president.

AC

HEYDEN CHEMICAL CORPORATION's directors have approved their company's acquisition of Newport Industries, Inc. The transaction is subject to approval of Heyden stockholders at a special meeting on Dec. 27.

Pyrophyllite is the ideal diluent and extender for agricultural insecticides

Glendon's Insecticide Grade Pyrophyllite

Wt per cubic foot—30 lbs

92 to 95% will pass a 325 mesh screen

pH range of 6 to 7

Non-alkaline and chemically inert

Average particle size below 5 microns

Insecticide Grade Pyrophyllite is the ideal diluent and conditioner for all types of insecticidal dusts. As it is non-hygroscopic, dust compounded with Insecticide Grade Pyrophyllite will not absorb moisture. Nor is there any tendency even during extended storage, for the carrier to separate from the active ingredients.

Insecticide Grade Pyrophyllite has superior adhering properties, and because it is difficult to wet, it holds well on the plant leaves even during rain. When used as a carrier for products to be dusted by airplane, it settles rapidly, minimizing drift, waste of materials, etc.

Send for Testing Samples

GLENDON

Pyrophyllite Company
P. O. Box 2414
Greensboro, N. C.
Plant & Mines, Glendon, N. C.

ESA EASTERN BRANCH

(From Page 81)

search and Development Center, Natick, Mass., was the panel's moderator. The central point of agreement reached by the panel was that considerably more people are needed to work in the field of entomology.

Dr. Robert L. Patton of Cornell University reported on the work done in insect research in civilian laboratories. "Despite the need for more

men," Dr. Patton declared, "there is no place for amateurs in the laboratories." He said that the field has advanced to where it is now a job for professionals.

Dr. Patton noted that 20 years ago only three schools taught entomology and that, with the advent of DDT, "the science of entomology came of age. It evolved from a natural science to an exact science."

Dr. Vincent G. Dethier, Johns Hopkins University, Baltimore, re-

ported on research done by the Army Medical Service in basic physiology, basic genetics, basic ecology, and basic insect populations. He also deplored the scarcity of people willing or able to participate in this type of work.

Charles C. Hassett of the Army Chemical Center, Maryland, dealt with his organization's studies in such problems as resistance in mosquitos.

Mr. Pratt, the moderator, exhibited a number of slides dealing with the fundamental biology of cockroaches, as an example of the work going on at the quartermaster laboratory in Natick, Mass. "Although the fundamental studies seem useless now," he said, "this sort of work is leading to something of use."

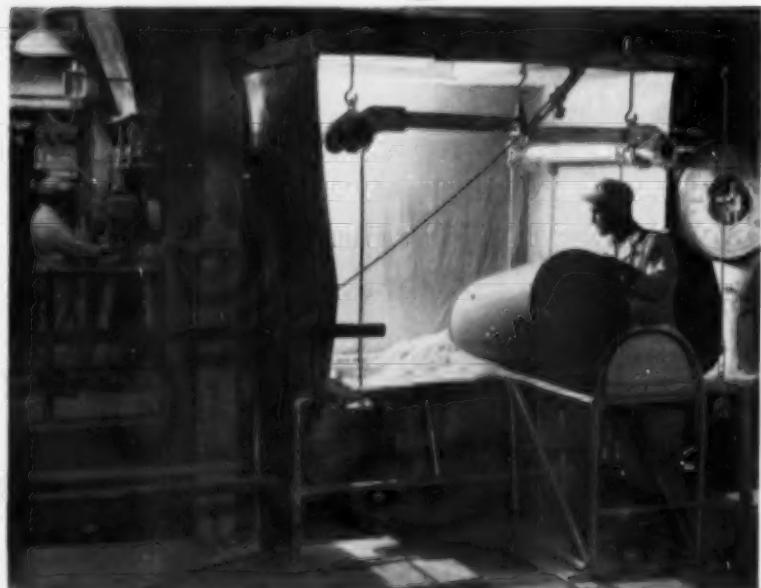
DR. Emery D. Burgess, of Plant Pest Control Branch, USDA, Washington, led off the first afternoon session with a report on the "Recent Developments in the Plant Pest Control Branch." He described his department's successful campaign against the Mediterranean Fruit Fly in Florida this summer. He reported that the spread of the destructive pest has been virtually halted, and the fly is being wiped out.

Dr. Burgess narrated a film illustrating the Medfly war which showed the relentless campaign waged by the Plant Pest Control Branch. Rigid inspections and quarantines were combined with traps and aerial applications of insecticides to control the fly.

Although entitled "Answers to the Problems of Amateur Growers of Shrubs and Ornamental Plants," a panel discussion moderated by Dr. John A. Naegele, of Cornell University, admittedly did not have the answers, just the problems plus some recommendations.

Dr. Louis Pyenson, Long Island Agricultural and Technical Institute, Farmingdale, N. Y., presented the problem of helping the new home-owners with their agricultural problems. He described the hordes of new home-owners in the New York area who know absolutely nothing about such problems.

Dr. Pyenson indicated that commercial fertilizer and insecticide companies might help in this problem by



Formulating for air mill grinding system at main plant, Richmond, California.

**PROCESSOR OF INSECTICIDES,
FERTILIZERS, WEED KILLERS,
FUNGICIDES, FUMIGANTS**

UNITED-HECKATHORN

Main office and plant: 600 South Fourth Street, Richmond 4, Calif.
Phone: LANDscape 5-9210

Plants at Soledad, Corcoran, El Centro, Lemoore

employing experts to whom the home-owner might go for information.

Dr. Cynthia Westcott, Glenn Ridge, N. J., of the National Council of State Garden Clubs, stressed the ignorance of home-owners in handling insecticides they are using.

Speaking for industry, Joseph E. Evans, E. I. DuPont Co., Wilmington, Del., declared that industry would be glad to put together an all-purpose insecticide but the trick is to get people to buy it. He explained that people are conditioned by advertising to want something marked "new" and, therefore, the tried and true insecticides do not sell.★★

Vitro to Acquire Berkshire

Vitro Corporation of America, New York, has signed an agreement to purchase Berkshire Chemicals, Inc., of New York. Vitro will acquire all outstanding shares of the chemical sales firm in exchange for 12,667 shares of Vitro stock effective Dec. 1.

Berkshire, which has five branch offices located in New York, Boston, Chicago, Cleveland, and Philadelphia, will become a wholly-owned Vitro subsidiary. Malcolm McAllister, Berkshire president, will continue in that post. No personnel changes are anticipated.

The new subsidiary will continue its own business intact and, in addition, will handle sales for two Vitro divisions, the Vitro Manufacturing Co. of Pittsburgh, and Vitro Rare Metals of Canonsburg, Pa.

INSECT ACTIVITY

(Continued from Page 57)

germana) which is distributed in most of the Eastern Seaboard States from Massachusetts to South Carolina and west to Ohio was collected in Tennessee for a new State record. The weevil (*Calomycterus setarius*) was found at Walpole, New Hampshire in August for the first record for the State. The vetch bruchid, a serious pest of vetch, was taken for the first time in Kansas. This pest is rather generally distributed in the eastern states, as well as in the extreme northwestern part of the country.

Forest insects which established new State records included the smaller European elm bark beetle, found for the first time in New Mexico, the pine gall weevil (*Podapion gallicola*) which was taken in the Auburn, Alabama area for a first record for that State and the willow sawfly (*Nematus ventralis*) which was taken for the first time in Arkansas in the Washington-Benton area. The sawfly (*Arges capularis*) was reported in Wisconsin for the first time from Pierce County where it was defoliating elms.

SOIL BANK

(From Page 85)

er than estimated. The study estimates that of the 22-25 million acres to be placed in the AR, 6½ million acres will require cover for soil fertility maintenance.

The NPFI study admits that it did not take into account the three-year trend of fertilizer usage, in which annual consumption has generally leveled off and even decreased slightly.★★



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AAI MEETING

(From Page 45)

ing application of agricultural ammonia—and extended drought in some areas as things which tended to "slow down" anhydrous ammonia expansion and retard industry across the board. Distributors in vast numbers adopted a "wait and see" attitude, Mr. Criswell said.

"In the interim," he continued, "most followed the pattern of big city home owners who each spring put up a 'For Sale' sign just to see if some sucker will pay the price—well, this year there were lots of signs taken down but there were also lots of sales." Mr. Criswell pointed out, however, that "by the time the decision to sell or stay in business was reached, other phases of the industry were affected, for instance, the season was over for the accessory manufacturer, and undoubtedly the period of dilemma handicapped the distributor in putting forth his best effort in distributing anhydrous ammonia."

Developing the theme originally expressed by Gen. Wooten, Mr. Criswell said, "Then, of course, a few distributors got the mistaken idea that price was the answer—did you ever stop to think how ineffective a gasoline price war is for increasing the volume of gasoline used?"

"How much increased ammonia could be sold in your area if the price were cut in half?" he asked. "Gentlemen, farmers don't buy our product like staple groceries or can goods." Mr. Criswell declared, "You have yet had a farmer complain about the price of N in anhydrous ammonia as compared to other forms of nitrogen."

Mr. Criswell mentioned that selling agricultural ammonia is a sale job in a highly competitive market and those who cannot, or will not, view the situation in such a light are "doomed to a short life" in the distribution of this form of nitrogen.

Although 1956 was a "good and bad" year for the industry, Mr. Criswell announced that, on the other hand, 1956 has been a good year for the Agricultural Ammonia Institute. He stressed the increase in member-

ship and the expansion of the full-time staff.

Mr. Criswell described some of the services and programs carried on by the Institute, such as: the bi-monthly publication, "Agricultural Ammonia News"; the Midwest Research Report which brought out numerous suggestions for increasing anhydrous ammonia usage; the continued research into the vexing problem of tank failure; and the educational meetings which tend to increase cooperation and appreciation among

research, teaching, and extension personnel in the areas in which the meetings are held.

Dr. D. R. Rodd, Hedgesville, W. Va., led off a three-man symposium on Pasture Fertilization and Improvement presided over by Tully W. Talbot, first vice president. Dr. Dodd stressed that, "Much educational work needs to be done, especially in the use of increased quantities of nitrogen fertilizer on grassland."

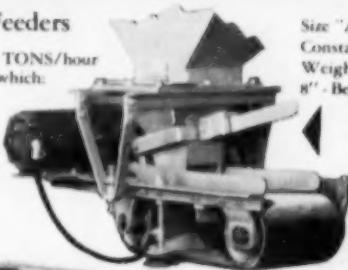
Dr. Dodd reminded the delegates that "you can profit only as the farm-

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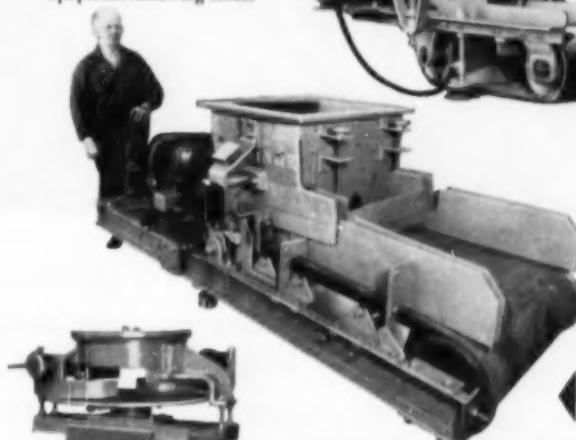
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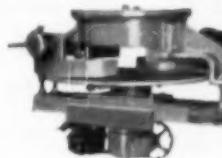
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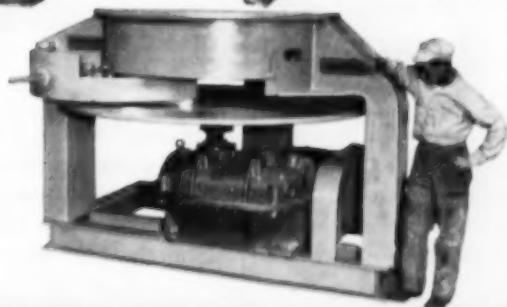


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er profits. In the long run it would be better that no sale was made than the product sold be used in a manner which produces a loss rather than a profit." Dr. Dodd suggested that the industry's contact men give more attention to a study of the farmer and his operations. "Frequently, it seems to me," he said, "these men do not recognize the farmer's limitations and the factors which limit his crop production."

Dr. Dodd illustrated his address with pictures of farmers' problems and practices in the United States and abroad and concluded with a few summary statements. "Grassland fertilization is profitable only to the degree to which the extra production can be marketed," he said. "This depends upon the farm, the farmer, the livestock and the type of farm and livestock management." Dr. Dodd warned that the present idea that legumes are the best source of nitrogen for grasslands may be in error in many situations. "This concept," he explained, "developed when commercial nitrogen was limited and more expensive then at present."

The second speaker on the pasture panel was George A. Rogler, research agronomist of the Northern Great Plains field station at Mandan, N.D., who dealt with a recent study of range fertilization on the Northern great plains. Mr. Rogler pointed out that "nitrogen fertilizer applied to heavily grazed native grass improved the condition of the range at a much more rapid rate than complete isolation from grazing without fertilization."

He added that the "use of nitrogen would appear to be a valuable tool along with other range management practices in the improvement of heavily grazed ranges. "Increased production was obtained not only on heavily grazed native pastures but on properly grazed pastures as well," he said.

Mr. Rogler found that the results of the study indicate a "great potential for more efficient production, and increased return per acre by proper use of range fertilization in the Northern plains where the major portion of the land is in grass."

The panel's concluding speaker, W. R. Thompson of the Mississippi Agricultural Extension Service, compared today's conditions with conditions of 25 to 30 years ago. He pointed out that one of the greatest things that has happened in the United States to agriculture is that we have reduced the acres planted to the different crops, but raised the per acre production on all crops. "Had reduction of acreages come along and we had not had fertilizer to increase per acre production," he said, "the farmers would have been in serious condition."

"Small grain production really came into its own," Mr. Thompson declared, "when farmers were convinced it really paid to use nitrogen for higher production."

J. Richard Adams and Walter Scholl presented a paper titled, "Nitrogen Fertilizer Materials for Direct Application." They stressed the fact that ammonium nitrate has consistently supplied more direct application nitrogen since 1946 than any other individual material. The increase in the use of the liquid sources of nitrogen has been possible because of the expansion of the ammonia industry.

The paper further stated that there were nine domestic synthetic ammonia plants with an estimated annual production capacity of 377,000 tons of nitrogen previous to world War II. By 1957, they predicted, this capacity will be 3,544,000 and there will be 46 plants with at least one in each continental area, except the mountain region.

The convention also heard Dr. Byron T. Shaw, administrator of the Agricultural Research Service, U. S. Department of Agriculture, Washington, D. C., who spoke on the "Role of Research in Meeting Agriculture's Needs." Dr. Shaw declared that the most critical problem facing research today is the restoration of the balance in agricultural production. He warned that events of the future will bring still further challenges.

The final business of the convention was to select Chicago as the 1958 convention site. Last year, the institute agreed to meet in Little Rock, Ark., in 1957. ★★



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PESTICIDE APPLICATION

(From Page 49)

sewn bags, which prevent transmission of moisture through the needle holes, have included heat sealed polyethylene coated paper closures and pressure sensitive tapes. Such closures, he said, may also prevent sifting of contents and infestation by insects. The development of the pasted moistureproof bag for fertilizer has resulted in greater economy, with equal or better moisture resistance. Recent developments in stepped end bags give possibility to a completely moisture-proof bag at a reasonable cost. Specifications for bag constructions for over a thousand new products have been issued in recent years as the result of chemical tests made on the product to be packed.

Among newer developments, still in laboratory stage, are the plastic stitch to replace present moisture permeable sewn ends, a tear strip for the pasted bag, which enables easy opening of the filled bag; development of foam plastic, which will result in better insulating bags; and the eventual development of an all plastic bag.

Sampling Fertilizer Materials
BECAUSE of the increased emphasis on uniformity and product specifications, a substantial part of the meeting was devoted to sampling procedures, sampling equipment and quality control. J. Archer, International Minerals & Chemical Co. described a tube sampler, double tube slotted sampler, sampling cup, modified soil auger, sample container, sample preparation table, sample riffle, stock pile sampling, etc. He offered blueprint drawings of all the equipment discussed.

C. W. Schneider and M. D. Sanders, Swift and Co., Chicago, continued the discussion of sampling, compared results obtained with the Indiana sampler, slotted single tube, and riffle. They reported that their study casts some doubt on the precision of the single slotted tube, although it did not take into consideration different sized tubes or fertilizer other than that having a wide size range.

Discussing "Flowraters and Flow

Control," D. J. Tricebock, Fisher Porter Co., reported on simultaneous and automatic feeding of several materials at predetermined rates, and particularly, on mechanisms involving a "wild feed," and controlled lines based on specific ratios of the "wild line." Mr. Tricebock included charts and photographs to illustrate his comments. ★★

EDITORIAL

(From Page 29)

manufacture, storage, distribution and use of pesticides, which could readily justify a full fledged safety program themselves. Off hand, we can think of no field where safety is any more important than it is in the insecticide industry.

FERTILIZER BAGS

(From Page 41)

ing. Applications are made to incorrect areas. The manager of one firm of applicators ordered fields A

and C treated, but field B, which was owned by another farmer, got a treatment he didn't want.

There was the case of an ineffective TEPP application. The recommended dosage for the pest and the crop was one pint of TEPP technical in ten gallons of water per acre. The job was done with one pint of TEPP in three gallons of water and you know why. Three gallons per acre gave inadequate control of the pest but the extra strength of the droplets succeeded in damaging the crop. Double trouble from cutting corners.

Most of our aerial applicators are men of integrity and good judgment. In California no claim of chiseling by operators has been proved. The Department of Agriculture has investigated rumors and charges by checking the number of tanks flown in a given time by suspected applicators, by calibrating tanks for load and checking fields as to acreage. In every case so far, the volume applied has checked out as to dosage per acre.

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That is the good side of the picture.

It appears that the best protection any aerial applicator can have against unwarranted charges of cheating is to maintain a meticulous record of each job done. If he keeps an accurate and complete log of every condition under which his pilots have operated, the exact dosage of the active materials and the exact amounts of the carriers used in each load, the capacity of the plane used, etc., etc., he will be able to stand up and be counted if such charges ever reach investigation stage. It's like the federal income tax—if you do not have a written record you have no standing.

The sum of all that I have tried to impress upon your minds, and the surest way for every applicator and every farmer to keep out of trouble with organic phosphate compounds, is

embodied in the advice of the United States Department of Agriculture and the Food and Drug Administration to: "Use pesticide sprays and dusts only as directed on labels; only on the crops specified; only in the amounts specified; and at the times specified." ★★

MID WEST SOIL CONF.

(From Page 51)

"The soil bank will probably have a double-headed effect on fertilizer consumption," Mr. Butz said. "To the extent that the acreage reserve reduces acres in basic crops, all of which are relatively heavy fertilizer users, it is inevitable that it will have a negative effect on fertilizer consumption."

Based on expected variations in acreage reserve participation by re-

gions, he said, Agriculture Department specialists have figured that the maximum indicated reduction in fertilizer use on the six basic crops involved will be 930,000 tons. These basic crops are wheat, corn, cotton, rice, peanuts and tobacco.

"On the other hand," he continued, "it is entirely probable that farmers will intensify fertilizer usage on the remaining acres in basic crops, as well as on land devoted to other crops. Moreover, new seedings on the conservation reserve acres will use additional quantities of fertilizer."

The higher rate of fertilization on land remaining in basic crops and on land devoted to other crops, he said, will offset the maximum negative effect, so that the net negative effect of the acreage reserve program on fertilizer consumption might be as little as 400,000 tons. Assuming new seedings on about 12 million acres of 1957 conservation reserve land, a market for some 750,000 tons of fertilizer may be expected if used at average rate of 150 lbs. of fertilizer per acre. This, he added, for reasons which he detailed, can be expected to decrease in future years.

"It is at once apparent," said Mr. Butz, in summing up his calculations, "that if you put together the contemplated reduction of 400,000 tons of fertilizer because of the acreage reserve program and the added 750,000 because of the conservation reserve program, you come out with a net increase of 350,000 tons."

The Department of Agriculture, Mr. Butz commented, has in recent years been criticized for its continued support of research and education designed to increase crop yields per acre and at the same time sponsoring a program to curtail farm output.

"On the face of it," he said, "these two activities may appear to be in conflict. Yet we must ever strive through research and education and through the application of science to agriculture, to increase production per unit of input, to reduce costs, to expand efficiency and through proper pricing, and effective promotion, to translate these benefits into expanded markets. . . . On the

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whole, the impact of both the USDA and the state experiment stations on agriculture has been good."

Continuing, he discussed some significant achievements of technology and science in agriculture. At some length, too, he examined arguments recently voiced vigorously by the administration's "opponents" and explained what it is hoped can be accomplished by the program presently in effect.

"It is never self-defeating," Mr. Butz declared, "for farmers to apply science and technology to lower unit costs and to increase efficiency, so long as this practice is combined with realistic pricing programs and effective promotion which moves the bounty of our production into effective use, rather than into government warehouses."

"The acreage reserve feature of the soil bank was never conceived as a permanent program. It should be operated only long enough to effect a desirable balance between production and consumption. If, during this interim, progress can be made in adoption of a farm program with sufficient flexibility to permit a dynamic agriculture to adjust to the changing supply and demand situation, it is possible that our agriculture may once again move forward without the strangling effects of unmanageable surpluses and free from the deadening hand of bureaucratic restriction."

"Under these conditions the American farmer—the most scientific and the most efficient farmer in the world—should be able to regain his rightful place as a low cost producer of food and fiber for a growing market both at home and abroad. . . . And when the opportunity to produce need no longer be curtailed by federal regulations, the American farmer should see his income prospects considerably brightened."★★

OLIN MATHIESON

(From Page 39)

and agricultural pesticides, including soil and foliar fungicides, nematocides, insecticides, miticides, bacteri-

cides, grain fumigants and herbicides.

The laboratories have developed more than 400 pesticide formulations, which are in use today and provide the basis for the corporation's insecticide business.

A recent achievement is the development of Terraclor, the first non-volatile soil fungicide, which now is marketed by Olin Mathieson for use on a variety of crops.

B. B. Brown is section chief for research at New Haven and acting leader for the analytical and trace analysis groups at Port Jefferson. S. S. Ristich is acting leader of the biological screening group. R. S. Zerkel is leader of the new product development group. G. R. Mitchell is assistant section chief and R. E. Castle is leader of the process development group. W. K. Cline is group leader for organic research at New Haven.★★

UNITED-HECKATHORN

(From Page 31)

disturb its relationship with the community and the growers. We try desperately not to move any of the men. The farmer doesn't often see our product or our label, but he has an established relationship with and confidence in the individual who is representing us and giving him service. We're merchandising a program and the people who carry it out."

United-Heckathorn also maintains storage facilities in some sixty California warehouses and one in the New York area, and a New York City sales and purchasing office.

SkySpray, the company's flying division, is based at the Hayward airport and operates 25 planes. It also equips, rebuilds and maintains them. They range from C-82's and B-18's to small Stearmans. Heckathorn, who started flying as a hobby, pilots Beechcrafts for personal transportation and for scouting and observation jobs. The company has recently acquired another crop dusting firm, Diablo Dusters at Brentwood, which will continue under its own identity.

Although United-Heckathorn is best known for its aerial spraying

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operations, the firm is not committed to the airplane any more than the tractor. "We're interested in application by whatever method is necessary—whatever the job, we'll find the equipment to handle it; most efficiently and economically," is the way Eugene Heckathorn puts it.

In recent years the contract division has handled more aerial spraying jobs by far than any other organization in the United States. They are usually done for government, with private agencies chipping in to help pay for programs designed to wipe out highly destructive epidemic pests. The bigger the area included in one campaign, the better for both effectiveness and economy. By using large planes, applications can be made to as many as 90,000 acres a day. Typical United-Heckathorn aerial application programs have been successful in controlling infestations of the beet leaf hopper in California, spruce bud worm in New Mexico and Montana, tussock moth in California, grasshopper in the plains states, and the recently returned Mediterranean fruit fly in Florida.

United Heckathorn's pre-eminence in this field is, according to Eugene Heckathorn's analysis, due to several factors. One is that the organization's personnel, largely made up of field men with varied practical experience and chronic enthusiasm for developing improved application techniques, is adaptable to such jobs. When a contract job begins, men are taken from various divisions and organized into a team which puts all its efforts into solving the problem at hand. A book-keeper and a laboratory man are borrowed from the main office, for instance, planes and pilots from SkySpray, service men and chemical processors from various local offices. Additional planes and trucks may be leased from other companies.

Planning of the entire program has gone on for many weeks before, and this is another factor for success. The company keeps informed of infestations of insects all over the world ("You ride with the insect in this business," says Heckathorn) and in many cases it prepares detailed plans for programs which may or may not

ever come its way. Although not all jobs planned for are landed, of course, this kind of "in case" work has proved so successful in keeping the organization on its toes and ready for anything that it is continued faithfully. "We worked all one winter figuring out a job we never got," Heckathorn explains, "and we talked over the Mediterranean fruit fly for two weeks before we had any idea that we were going to get the Florida contract. But by the time we did get a chance at it, we knew a good deal about the problem and how we'd handle it."

Actual carrying out of a program involves not only knowledge of insecticides and application methods but also in many cases the logistics of getting men, provisions, chemicals, fuel and equipment to remote areas. On the spruce bud worm job in Montana, United-Heckathorn had to keep a fleet of forty tank trucks moving on time between Salt Lake City and the remote flying strips in order to keep the planes supplied with aviation fuel and insecticide. Several of the flying strips themselves had to be made before the job could begin. The whole operation involved 25 airplanes and 250 people. In fourteen days approximately a million acres were sprayed.

In handling all large contract programs and many relatively small jobs as well, United-Heckathorn brings the chemical processing plant to the base of operations, rather than formulating the compounds before shipment. As few as five and as many as fifty people have been involved in these field processing operations. A small laboratory is usually part of the installation. One mobile field plant is permanently mounted on a trailer. When Agricultural Chemicals tried to arrange for a photograph of it, it was in the northern San Joaquin Valley mixing spray for a beet leaf hopper job and was scheduled next to be hauled southward for a cotton defoliation project.

For the Mediterranean fruit fly program in Florida, a plant was set up at the air field to handle the final mixing of 75,000 pounds of malathion 25% with a yeast-base attractant each day. (The company leased three Flor-

ida factories to keep the operation supplied with Malathion). A special problem solved on this job was the laying of the insecticide in streaks of droplets instead of a fine mist, necessary because it carried the attractant. Special spray systems had to be developed and built.

This is the sort of practical application problem United-Heckathorn likes to solve, the sort of problem it has grown by solving. Its research program, carried on constantly in the main Richmond laboratory, is designed to find not new products but new ways to make existing products better for use.

Eugene Heckathorn is president of United Heckathorn. Ivor Burden, entomologist and chemist who joined the organization when it merged with United Chemical Co., in 1952, is executive vice president and sales manager. And Louis R. Moretti, who has been with Heckathorn since 1948, is secretary-treasurer. Usually they are out in the field. If they happen all to be at the Richmond office at the same time, chances are that it is raining everywhere in California and they are enthusiastically plotting a program for controlling infestation of an obscure insect that has just been reported at some distant continental outpost.★★

CAKING TENDENCY

(From Page 35)

put, by subjecting the plant to one control overriding all other, as for example, maintaining a steady ex-drier temperature of solids of about 120-125°C (248-257°F).

Observation: overwhelming evidence that moisture contents were often very high or very low for the hour or two before and after breaks in production. For complete success in producing material of low moisture content and to produce it consistently: occasional jumps in moisture due to changes in operating conditions may not be tolerated.

Previously mentioned throughput was reduced. However, it is realized that a regular operation can not stand a reduction in throughput while burning the same amount of fuel as

a means of producing low-moisture fertilizer. Means had to be found of reducing thermal load or drier to offset increased load on drying to 1/2-1% instead of 2-5%. This was accomplished by reducing the amount of fines recycle through an improvement in the efficiency of granulation. Fines put a heavy load on drier because they are re-wetted and have to be re-dried and they do not agglomerate easily, making granulation more difficult in proportion as fines increase.

The effect of fines is cumulative.

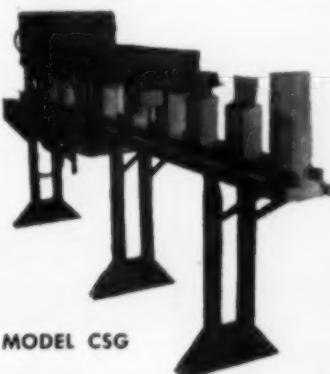
(k.) Improvement of efficiency of granulation.

Efficiency of granulation is important because it reduces the amount of fines to be recycled. Thus, reduction permits thorough drying, while maintaining high throughput rate and keeping drier capacity down. Definition of efficiency: the percentage of material in the size range 1 to 3.4 mm. (5-16 mesh B.S.S.) and applies to material coming out of drier, that is, prior to screening.

(l.) The gaseous effluent. The problem of atmospheric pollution can be divided into 3 headings: I fume; II dust, and III acidity and acridity. Dust and acidity can be handled to some degree by a water irrigated tower; fume is very difficult to reduce, and is believed to be the worst offender. Fume consists chiefly of sub-micron size ammonium chloride particles — ammonium fluoride and hydrogen chloride are probably present also.

Since high drier temperatures are involved in drying fertilizer to low moisture, volatilization of ammonium chloride will increase.

Ammonium chloride begins to volatilize in appreciable quantities at 180°C (365°F). Fume could be formed from the particles of fertilizer dust suspended in hot drier gases, such as exist at inlet to drier. Some ammonium salts could conceivably be volatilized from over-heated material on the drier feed chutes of co-current driers.



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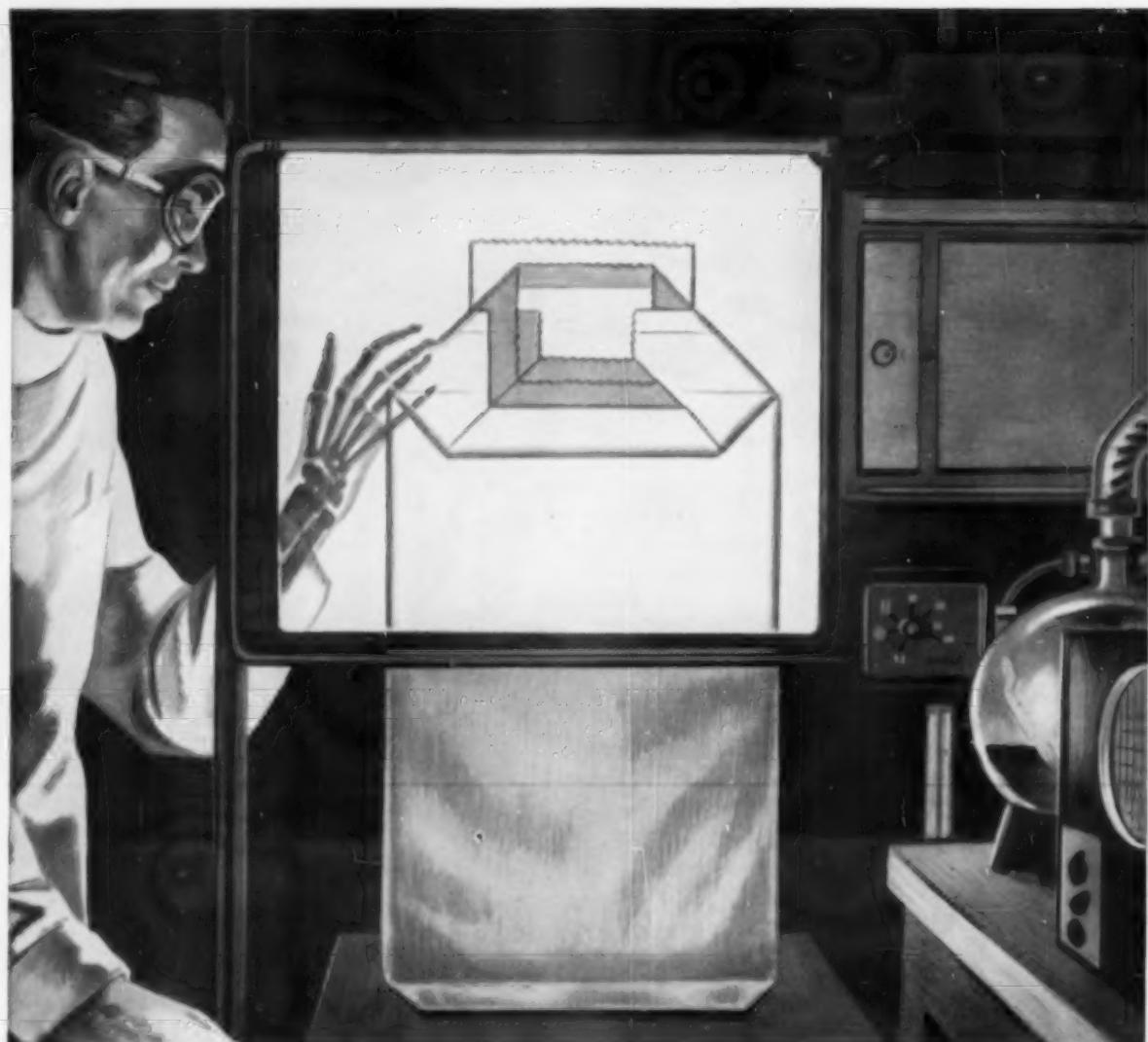
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Using a 1500 c.f.m. Venturi scrubber achieved more than 99% chemical efficiency, and about 75% visual efficiency in the removal of fume. It is possible also to volatilize ammonium salts at the fairly low temperature caused by the heat of reaction between ammonia, sulfuric acid, muriate of potash and superphosphate. *Final comment.*

Dr. Raistrick does not claim he has the answer to the caking problem for all plants. He does claim that by adhering to the 30% relative humidity in the drying specification they have produced 400,000 tons of non-caking granulated fertilizers, and this was accomplished at all times. After choosing this specification, it was up to process development and process control to work out the ways and means. "The granulation plant," he adds, "must be operated continuously in balance, with a minimum of stoppage, both planned and unplanned, which might cause deviations from the chosen conditions. The characteristics of the raw materials, and the quantity of granulation water used must be controlled as far as possible to give steady operating conditions." ★★

OVEX ACARICIDE

(From Page 47)

collected at harvest. Some of the possible factors involved are:

1. Small difference in fruit maturity from any cause. Although the fruit from treated and untreated trees was picked the same day, it is well known that fruit maturity may vary slightly from tree to tree because of variations in soil, crop load, tree vigor, etc.
2. Difference due to favorable or unfavorable effects of ovex on the leaves or fruit.
3. Difference due to presence or absence of mites.
4. Difference due to variations in processing of individual samples.

Summary

APPLE trees were treated with the acaricide ovex in various formulations and schedules. The work was a cooperative study and was conducted

in 4 localities, namely, Vincennes, Indiana; Wooster, Ohio; Geneva, New York; and South Haven, Michigan. The sub-experiments were similar in nature and included six apple varieties. At harvest, fruit samples were collected and transported to the Beech-Nut Life Savers, Inc., where they were processed into applesauce, and subsequently brought to the New York State Agricultural Experiment Station, where they were taste evaluated. In addition, taste evaluations and chemical analyses of lots bearing maximum residues were made by Beech-Nut Life Savers, Inc.

While taste differences were detected between treated and untreated samples in an appreciable number of instances, there was no consistency in the results. It was concluded that the small differences found were caused by factors other than the ovex treatments. No objectionable off-flavors were detected. These results were confirmed by taste evaluations made by the Beech-Nut Life Savers, Inc., and their conclusion was that all samples were acceptable.

Ovex residues on fruit prior to processing ranged from .08 to 1.17 ppm. With one possible exception no ovex residues were recovered from the applesauce samples. ★★

FERTILIZER VIEWS

(From Page 55)

best prospects for profitable fertilizer consumption.

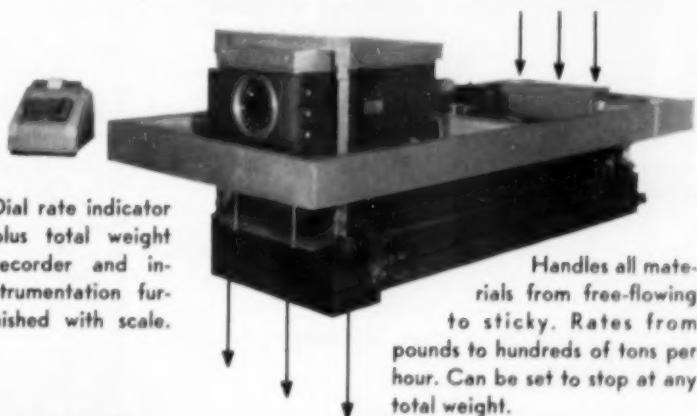
Chemical Nitrogen on Legumes

DOES it pay to apply chemical nitrogen to legumes? This question has been debated many times in the farm press and at farmers' gatherings. Is there any definitive answer?

It is known, of course, that legumes can develop their own nitrogen by means of the nodular organisms on their roots. To apply nitrogen to a legume crop is a waste of good money, say the opponents. Yet, nitrogen on beans and peas pays off, as is proved by general farmer experience. The question comes up most frequently in discussions of how to fertilize alfalfa or a grass-legume sod.

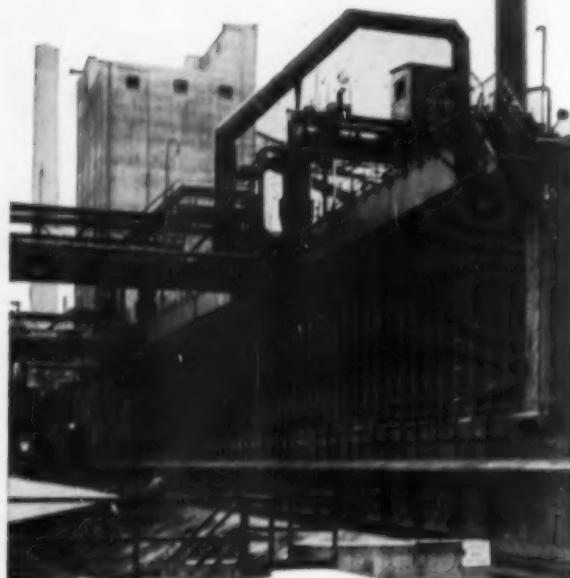
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Some advocate the use of a nitrogen fertilizer on the basis that under an intensive system of farming the nodule-bacteria cannot supply enough nitrogen to make the goal of needed big crops; others contend that applied nitrogen will depress the growth of clover in a grass-clover sod.

A British contribution to this controversy, published in *Journal of Agricultural Science* 1955, 46, 441, gives an answer that although simple, seems logical.

Experiments were made at Cambridge using a grass-alfalfa sod to which 300-pounds of sulfate of ammonia were applied in each of three successive years. But the alfalfa was not suppressed, and the yield of grass was increased significantly. This is the explanation given: In a grass-clover sod, the applied nitrogen stimulates the grass, which grows faster and shades the slower growing clover. Clover is therefore suppressed. But, in a grass-alfalfa combination, the alfalfa, being taller than clover by nature, grows as rapidly as the grasses and suffers no shading effect. The authors suggest that in a fertilizer grass-clover sward, coexistence is favored by cutting the grass frequently or keeping it short by managed grazing.

It seems highly desirable as a good management aid to fertilize these grass-legume sods for maximal yields.★

HYDROPONIC FARMS

(Continued from Page 33)

In a labor-cheap nation such as Japan, it costs approximately the same to produce a pound of vegetables in hydroponic as it does in soil farming. Labor costs are less in soil farming, of course, but the yield per acre is much higher in hydroponic beds.

For example, an average of 92,000 pounds of cucumbers is grown on each planted acre of hydroponic beds — only 21,000 pounds are produced from the same soil acreage. About 56,000 pounds of green onions are grown per acre in hydroponic farming, and only 22,000 in soil.

There are other advantages to hydroponics. For one thing, it's much easier to control weeds in the gravel beds. Water is supplied as needed, and only the heaviest thunderstorms dump rain in such quantities as to threaten to drown the crops. The ground can't freeze, and even too much sun can be cut down by placing tobacco cloth over rows of young plants. Finally, plant diseases don't build up in the soil as they do in normal farming.

But the Chofu farm is no stranger to plant pests and diseases. During the last 10 years, 44 insects and 90 plant diseases have turned up at the farm in either the hydroponic or soil sections — sometimes in both. The principal insects are generally familiar to farmers in the United States — aphids, cabbage worms, cut worms, wire worms, nematodes, red spiders and onion maggots. The most troublesome diseases are bacterial wilt on Chinese cabbage, early and late blight on tomatoes, downy mildew on onions, grey mold on tomatoes and lettuce,

and lettuce drop and powdery mildew on cucumbers.

The horticulturists, plant pathologist and entomologist form the nucleus of a plant protection team that prepares fungicides and insecticides and supervises their application. Some 1,800 pounds of fungicides and 8,800 pounds of insecticides are used on the farm each year. Most are common, well-known preparations — DDT, methoxychlor, parathion, malathion, vapanone, lindane, toxaphene, copotex, kryocide, cryolite, orthodox.

The high price of labor in a country such as the United States would not make hydroponic farming an attractive practice here. The Chofu farm, laid out by Dr. Roy Culbertson, agricultural consultant attached to Tokyo Quartermaster Center, cost an estimated \$25,000 an acre to build. But it was worth it to the U. S. Army. Over seventy million pounds of vegetables have been shipped from Chofu in the last 10 years, with a peak of nearly thirteen million in 1954.

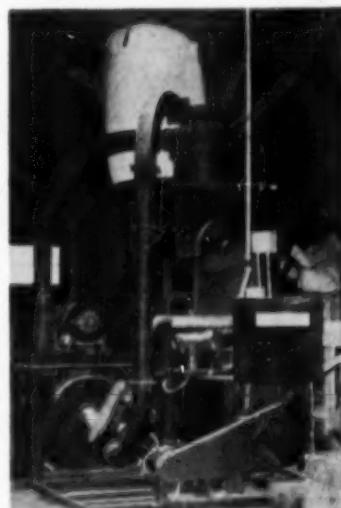
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Now, of course, the needs are dropping, as some Army units leave, and eventually the farm will be turned over to the Japanese government. When it is, Japan will have a real jump on most of the nations of the world as far as chemical agricultural equipment and know-how are concerned. ★★

CATTLE TICKS

(Continued from Page 44)

The necessary frequency of treatment rules out concentrations as costly as those in use in America. Also, insecticides are more costly in Central Africa. However, until losses caused by ticks and tick-borne diseases are completely assessed, no definite ceiling can be stated. Considering a 500 head herd dipped 40 times in one year (weekly rainy season, fortnightly dry season), the annual cost of arsenic in 1954 was £26. Benzene hexachloride wettable powder (100 ppm gamma) dip cost £35, and BHC emulsion £64. DDT wettable powder dip (0.1375%) cost £83, and emulsion £134. Toxaphene wettable powder dip (25%) cost £142, and emulsion £173. 0.17% toxaphene dip as wettable powder cost £97, placing toxaphene within economic reach and still giving control superior to the cheaper insecticides. It was suggested that an annual schedule of toxaphene rainy season, DDT dry season would be most appropriate for Northern Rhodesian tick species, at an annual cost of £99 for a 500 head herd. Comparing the application methods, 0.17% toxaphene emulsion dip at a cost of £116 could be replaced by 0.17% toxaphene pen spraying at £111, and spray racing at £103. Fuel, maintenance, replacement and labor are not included. Costs are based on dipping in a 3000 gallon vat, two chargings annually, $\frac{1}{2}$ gallon per animal take-out, and topped up 50% stronger than charge; pen spraying at 1 gallon per animal; spray racing at $\frac{1}{2}$ gallon per animal with 100 gallons excess.

Concluding from tick control data, economics, and practicality, dipping remains the most useful general

method for European owned cattle, replaceable by spray racing in the hands of mechanically minded Europeans willing to give adequate supervision. Only small European herds are adapted to pen spraying under complete organization, supervision, and operation by Veterinary Department personnel. ★★

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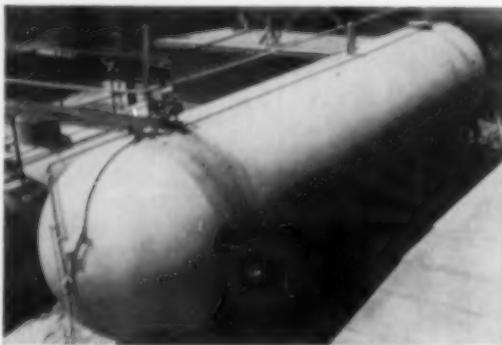
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Lawn Insects Bulletin

A new 24-page Home and Garden Bulletin on lawn insects issued last month by the USDA lists recent recommendations for controlling these pests. The recommendations are applicable not only to lawns but also to such places as parks, roadsides, cemetaries, and golf courses.

Many of the control recommendations were provided by State agricultural experiment stations. They apply to all types of pests; those which infest the soil and attack the plant roots, those which feed on plant leaves and stems, and pests that suck juice from the plants. The bulletin also recommends control for other insects and insectlike pests which inhabit lawns without damaging them but are annoying and sometimes attack people.

"Lawn Insects: How to Control Them" (Home and Garden Bulletin No. 53) may be obtained from the USDA, Wash., D. C.

Situations Wanted:

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Results of 1955

FUNGICIDE TESTS

1955 FUNGICIDE TESTS

The complete results of 1955 fungicide tests, listing response of various crops to commercial and experimental fungicides are contained in a 20-page, bound booklet.

The publication of these results is under the sponsorship of the American Phytopathological Society. It is a continuation of the publication of results formerly provided through a supplement of the Plant Disease Epidemics and Identification Section, USDA.

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U. S. Consumption Will Hit 41 Million Tons in '75, California Fertilizer Assn. Told

DELEGATES to the 33rd annual meeting of the California Fertilizer Assn. in Coronado, Calif., last month were told that fertilizer consumption in the U. S. will reach 32½ million tons by 1965 and 40 or 41 million tons by 1975.

These estimates, made by Dr. Philip Neff, Planning Research Corp., Los Angeles, were based on a forecasting system involving a correlation between fertilizer consumption and gross national product. Dr. Neff made his predictions during a talk on "Costs, Markets, and Prospects in the Fertilizer Industry." He said that some of the critical, and at times limiting, factors in the industry are high capital costs in relation to sales, a big materials handling problem, the extreme importance of capital equipment and its relation to cost of operations and the rapidly changing industry technology and markets.

The convention was held at Hotel Del Coronado Nov. 11 to 13 and was attended by approximately 600 association members.

Delegates also heard a talk on how to "Sell the Sizzle in the Fertilizer Industry" by Elmer Wheeler, sales manager expert of Dallas. "It's the sizzle that makes people buy," he said. "Selling is a trick, but it isn't trickery." Mr. Wheeler pointed out that the day of low pressure, sincere, scientific selling is here. He listed some aspects of his selling philosophy which included:

Don't write, telegraph. The first 10 words spoken to a prospect are more important than the next 50,000. Learn verbal shorthand.

Don't ask if, ask which. Always give the customer a choice between something and something, not between something and nothing.

A panel discussed aspects of fertilizer economics. Dr. J. E. Knott, University of California, was moderator and panel members were George Monkhouse, Shell Chemical Corp., San Francisco; Ned Lewis, Wilbur-Ellis Co., Los Angeles; J. Earl Coke,

Bank of America, San Francisco, and Dr. Neff.

Mr. Monkhouse cited the decrease in average prices of nitrogen and increased production and selling expenses as factors in creating a squeeze which could force some producers out of business. His prescription for success is to reach realistic markets with sound, efficient sales and services.

Mr. Lewis, who was on the panel as the mixer-distributor representative, recommended the use of the mixer-distributor as a "ready-made" distribution system for fertilizer.

Mr. Coke urged the association to see that bankers are made increasingly aware of new methods of efficient farm production.

Discussion during the panel session centered around the two problems of adequate and sound credit to farmers and marketing channels from producer to farmer. "There is no substitute for the local middleman," Mr. Monkhouse declared during the question and answer period.

Jack Baker, Bandini Fertilizer Co., Los Angeles, was elected president of the association to succeed William E. Snyder, Wilbur-Ellis Co., Los Angeles.

Republic Expands Capacity

The Republic Chemical Corp., New York, recently announced that installation of equipment for expanded capacity of their copper sulfate plant at Curtis Bay, Baltimore, has been completed.

Architect's drawing of the new administrative and research center planned by International Minerals & Chemical Corp., Chicago, in Skokie, Ill. The central research laboratory, at far right, was erected five years ago. The new project will cost an estimated \$3.5 million and will provide office space for growth predicted for 1965. Construction will begin early next year, with completion scheduled for mid 1958.



Leslie Joins Werthan

William J. C. Leslie has joined the sales division of Werthan Bag Corp., Nashville, Tenn., and will make his headquarters at the company's general offices at Nashville. Mr. Leslie was formerly manager of sales and advertising for Godchaux Sugars, Inc., New Orleans.

Credits on Calspray Plant

In the story in our November issue on the new fertilizer plant just put into operation at Richmond, Calif., by California Spray Chemical Corp., we failed to mention that the nitric acid plant was designed by Chemical & Industrial Corp., Cincinnati. C & I also designed the ammonium nitrate solutions plant, using the Stengel process, and the complex fertilizer plant using the PEC process. The ammonia portion was designed by M. W. Kellogg Co.

To Develop New Emulsifiers

Berkeley Chemical Corp., Berkeley Heights, N. J. has signed a licensing agreement with the Sugar Research Foundation for the purpose of operating under its patent application on sucrose esters, a new class of surfactants.

The new research and process development program will be followed early in 1957 by the manufacture of pilot quantities. Limited pilot runs were made at the Berkeley plant in November, 1955 in connection with the initial development work conducted by Foster D. Snell, Inc. for the Sugar Research Foundation.

The sugar esters may find widespread use in the agricultural chemical industry as emulsifiers for insecticides and weed-killers.

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Tale Ends

OME excellent advice was offered to custom applicators of pesticides in a talk by C. O. Barnard of the Western Agricultural Chemicals Association before the Annual Dusting and Spraying Conference at Walla Walla, Wash. last month. As

he pointed out, a high percentage of the cases of poisoning of aerial applicator personnel "follow familiar patterns of indifference to well-known hazards or gross and culpable carelessness." And it goes without saying that application of some of today's

highly toxic pesticides is a dangerous enough operation at best without magnifying the hazard further.

Custom spray operators have a big job on their hands in improving the industry's current rather spotty and unsatisfactory safety record. Responsibility rests largely on the shoulders of supervisors, — who too often fail to give the necessary close supervision and on occasion permit laxity in spraying practices. The answer is an undeviating insistence on use of appropriate protective clothing, goggles, gloves, respirators, etc., and frequent, periodic blood tests to insure that lowered cholinesterase levels will not predispose pilots to fatal errors. To guarantee that safety regulations will have teeth, discharge must be the immediate response to disregard of a major safety rule.

Pesticides, even highly toxic ones, it is generally recognized can be applied to crops with almost complete safety. It is probably a safe guess that nine out of ten of the serious accidents that do occur result from human carelessness rather than the inherent highly toxic nature of the pesticide. There is no question that the industry's safety record can be improved in a major way if the guiding policy will at all times be: "Use pesticide sprays and dusts only as directed on labels; only on the crops specified; only in the amounts specified; and at the times specified."

Those experienced in safety work have always emphasized that a good safety record for an industry is a full time job, that demands interest and cooperation right down the line. Safety must be indoctrinated into every worker and every supervisor. The program must be supported by never-ending publicity, and every accident which hurts the industry's safety record must be analyzed to determine where the precautionary system which could have prevented the accident may have broken down.

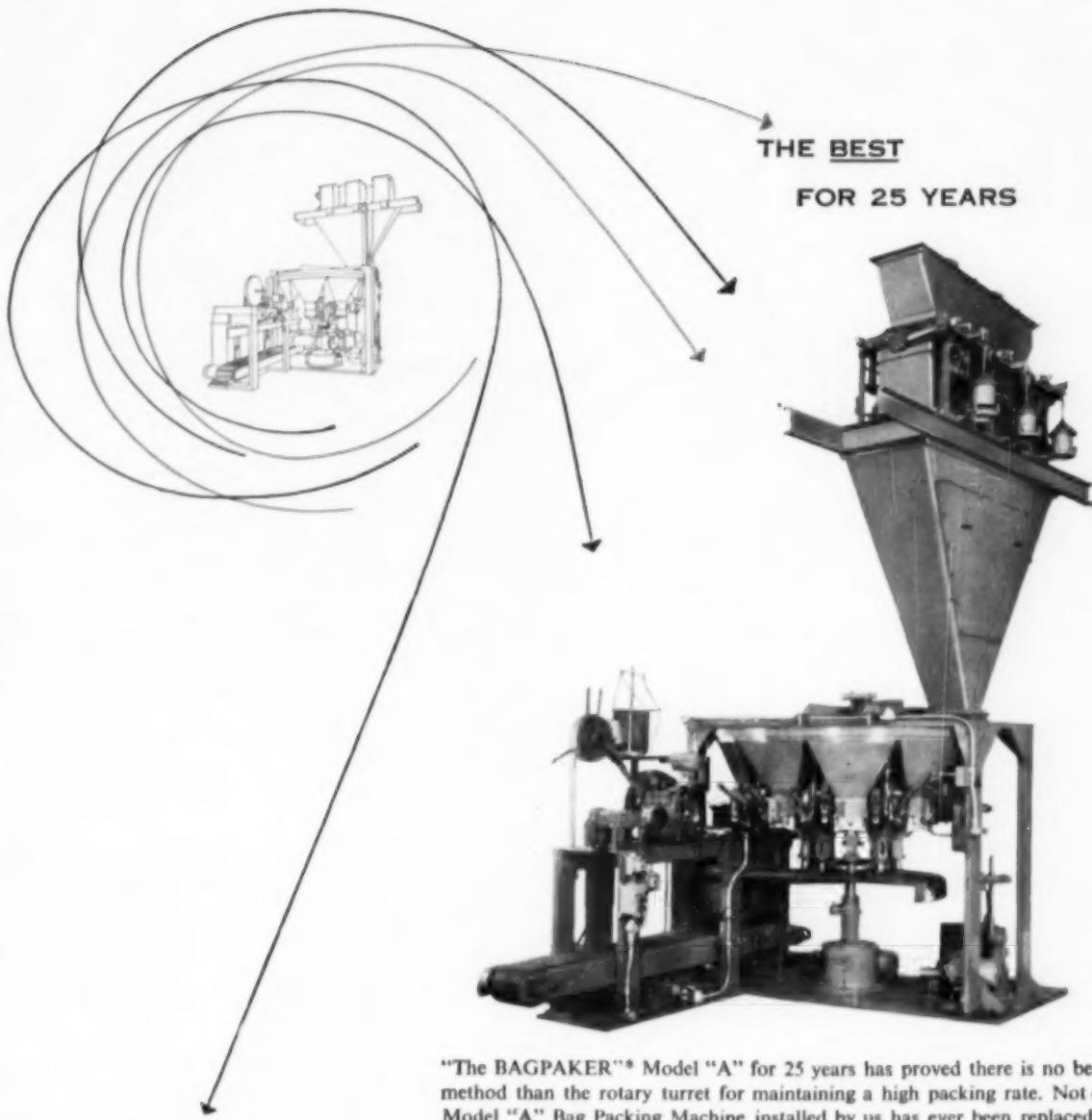
We can think of no industry where a determined and intelligent safety program is more needed than it is in the pesticide field. Nor can we think of any industry where an effective safety program would constitute better public relations.

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